DOCUMENT RESUME

ED 301 417 SE 050 131

AUTHOR	Mann, Lori D.; And Others
TITLE	Excellence in Environmental Education: Gaining Momentum for the Challenge Ahead. Selected Papers from the Annual Conference of The North American Association for Environmental Education (16th, Quebec City, Quebec, Canada, October 16-21, 1987).
INSTITUTION	North American Association for Environmental Education, Troy, OH.
PUB DATE	Jul 88
NOTE	582p.; For previous edition, see ED 287 691.
AVAILABLE FROM	North American Association for Environmental Education, P.O. Box 400, Troy, OH 45373 ($11.00).
PUB TYPE	Collected Works - Conference Proceedings (021)
EDRS PRICE	MF03/PC24 Plus Postage.
DESCRIPTORS	Citizen Participation; Communications; *Curriculum Development; *Educational Technology; Elementary Secondary Education; *Environmental Education; Higher Education; Instructional Design; *International Cooperation; *Professional Associations; Science and Society; *Teacher Education; Teaching Methods
IDENTIFIERS	Environmental Education Research

ABSTRACT

This document contains the proceedings of the annual conference of the North American Association for Environmental Education (NAEE). The conference featured seven keynote addresses and invited speakers, multiple workshops, panels, symposia, and contributed presentations. The first section of this document contains the speeches delivered by the keynote speakers as well as general session addresses. The remaining chapters contain extended abstracts of the conference presentations, including symposia and panels. Topics covered by the papers and symposia of this conference cover the areas of: (1) environmental education (EE) curriculum and instruction; (2) teacher education; (3) higher education and non-teaching professions; (4) environmental studies; (5) EE in the nonformal realm; (6) citizen action; (7) EE and communications; and (8) international EE. In instances where an extended abstract was not submitted, the short abstract from the conference program was included in order to provide a complete record of the conference. An author list of 128 names is provided. (CW)

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Excellence in Environmental Education: Gaining Momentum for the Challenge Ahead

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Conference

Quebec City, PQ, Canada

SE 030 131

Excellence in Environmental Education: Gaining Momentum for the Challenge Ahead

1987 Conference Proceedings

Selected Papers from the Sixteenth Annual
Conference of
The North American Association for
Environmental Education

Edited by

Lori D. Mann
Edward J. McCrea
Augusto Q. Medina

Published by

The North American Association
for Environmental Education
PO Box 400
Troy, Ohio 45373

July 1988

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PREFACE

This document contains the proceedings of the Sixteenth Annual Conference of the North American Association for Environmental Education (NAEE). The conference was held at Le Chateau Frontenac in Quebec City, Province of Quebec, Canada from October 16 through 21, 1987.

The conference offered many opportunities to learn of the most current activities in the field of environmental education, including four featured speakers, additional invited presentations such as symposia, seminars and a panel discussion by past NAEE presidents, and contributed papers. Each of the three sections of NAEE--Elementary and Secondary Education, Environmental Studies, and Non-Formal Education--sponsored and conducted a workshop targeted to its own interests. Field trips and special events rounded out the conference program.

The 1987 Conference was cosponsored by l'Association quebecoise d'interpretation du patrimoine with the assistance of Universite Laval. The successful partnership of NAEE and AQIP has led to a formal and continuing affiliation between the two groups. Again this year, a number of other organizations participated in the conference, including The American Nature Study Society and Wildlife '87.

The purpose of this document is to provide as complete a record as possible of the activities of the annual conference. It contains four sections: Featured Speakers and General Sessions; Invited Presentations--Symposia, Seminars and Panel Discussions; Section Workshops; and Contributed Papers. The latter are arranged alphabetically by author. Many of the papers have been edited to comply with space limitations and lengthier documents ave available from the authors. An address list of all published presenters follows the papers.

Although the official language of the conference was English, papers and presentations were accepted in French. Where papers were submitted in French, English abstracts have been included.

The full conference program, including abstracts of presentations for which no written record was submitted, is available from NAEE Headquarters.

Special thanks goes to Barbel Adkins for translating Mr. Lincoln's speech from French to

English and for proofreading the French papers included in this volume.

Finally, the editors gratefully acknowledge the staff and volunteers of NAEE Headquarters at Brukner Nature Center in Troy, Ohio for their commitment and dedication to this volume, and to NAEE as a whole.

Lori D. Mann
Edward J. McCrea
Augusto Q. Medina
Editors

FEATURED SPEAKERS
AND
GENERAL SESSIONS

WELCOMING REMARKS: NAEE COMES OF AGE

Jerry Berberet, NAEE President
Willamette University
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Bienvenue au Quebec, une province magnifique avec une histoire illustre. Je voudrais commencer la seizieme conférence de la NAEE. Avec la NAEE, le Canada et les Estats Unis sont bons voisins et bons amis. Merci beaucoup a Pierre-Jules Lavigne, à l'université Laval, et a nos autres amis du Quebec pour votre aide avec cette conférence.

I am delighted to be here, pleased to welcome all of you to the 16th annual NAEE Conference in one of the most splendid locations in North America. I'd also like to say that this is probably the earliest I have arisen on a Sunday morning for a long time. But we of NAEE are a dedicated group, so it is not surprising that several hundred NAEE people would arise at 7:00 a.m. on Sunday morning to begin what will be a rich and diverse program over the next three days. Ed McCrea, Lori Mann, Gus Medina, Joan Heidelberg, Pierre-Julés Lavigne and many others have labored long and hard to put this Conference together and we owe them our enthusiastic appreciation. And, a special thanks to the l'Association quebecoise d'interpretation du patrimoine and Universite Laval for your tremendous work with local arrangements and support for NAEE's first ever conference in eastern Canada.

As an organization NAEE has made tremendous strides during the past year. Perhaps we have even "come of age." We now have over 850 members, more than double what our membership was just four years ago, prior to our very successful Lake Louise conference. We have our first member from Mexico and she is a life member; all together we have members from more than fifteen countries. This year we especially want to welcome 175 new members of whom many are here with us in Quebec City. Last year you may recall, I offered as a challenge the goal of attracting 1,000 members, at the time an aim which seemed distant at best. In the very near future, however, we will achieve that goal. We want to make this conference an outstanding experience, so significant that you new members will not only stay with us but join us in Florida next October for the 17th annual conference to be held in Orlando.

In another area--we have developed a new format and increased frequency for the Environmental Communicator, our newsletter and the major way that the organization stays in touch with the membership. Also, during the past year we have added new professional publications, a computer network linkage called EcoNet, an ongoing curriculum review process through an agreement with the American Forestry Association, and were recognized internationally through the participation of several of our members in the August 1987 Unesco/UNEP Congress on Environmental Education and Training in the Soviet Union, the Moscow "Tbilisi Plus 10" Conference to assess accomplishments in EE internationally since the 1977 Tbilisi Intergovernmental Conference on Environmental Education and to plot a global EE strategy for the decade of the 1990s.

The NAEE Board completed two days of meetings yesterday afternoon and reiterated its commitment to expanding and improving services to the membership. Last summer many of you completed a member service questionnaire, the results of which provide insights to steps that can be taken for our organization to be in closer touch with its members.

We will continue to explore ways to make the Environmental Communicator even more effective. We will continue to study ways to make our publications even more useful in meeting the needs of an even greater range of members. We are considering various approaches to new services such as those that might be provided on a regional basis across this vast continent of North America. The conference will not be coming back to Quebec for a few years and we need ways to have more of an ongoing relationship with Quebec and with regions all around North America. We are exploring ways to increase support for our NAEE Headquarters at the Brukner Nature Center in Ohio. We are considering an expansion of contacts and cooperation with other organizations in the environmental education field such as the Conservation Education Association, the American Nature Study Society, the Alliance for Environmental Education and l'Association quebecoise d'interpretation du patrimoine. In 1989 our conference will be a joint venture with CEA to be held at Estes Park in August. Planning for this historic gathering is well underway and it should be a memorable conference. NAEE has many challenges for the future and you the members have shown a great deal of enthusiasm to move toward ambitious future goals.

We also need to develop contacts and explore appropriate relationships and services with Hispanic North America. These contacts are now in a very preliminary stage. We need to increase our attention to the international scene generally. North America has not been nearly as visible in EE internationally in the 1980s as we were earlier. This need for our international involvement was mentioned to us frequently by the delegates in Moscow. Certainly, our ultimate goal is to secure the well being of the entire biosphere. It will not be good enough simply to address a portion of it. We were struck in Moscow with the frequency that peace and environment were considered linked issues, so much so that some of us wondered if public opinion in support of environmental education in other parts of the world has caught up with and in certain areas surpassed that in North America. On another front internationally we have begun plans to make it possible for a large delegation of NAEE folks to participate in the 1990 Decade Conference in Australia of the Australian Association for Environmental Education (AAEE). Planned for August 1990, I believe in Adelaide, this will be a tremendous international EE event and an opportunity for NAEE members to reciprocate regarding the attendance of a large AAEE delegation at our 1984 Lake Louise conference.

Turning to curriculum--over the last few years there has been a major and ongoing inquiry into various problems with the effectiveness of formal education at all levels. Reform efforts have gotten underway to achieve excellence in education generally. We need to find ways to position environmental education much closer to the mainstream of these efforts to strengthen general education, possibly by associating more closely with the established academic disciplines and basic subject areas, including teacher education program content. All teachers should receive environmental education, not just teachers of environmental education. Professors in all disciplines should incorporate environmental content into their subject matter. All students should develop environmental awareness as part of their basic general education, not just students in environmental education courses.

As well, we environmental educators must incorporate new content developments into our own instructional presentations. We must ask ourselves if an environmental paradigm or world view developed in the 1960s and 1970s is adequate for the era of electronic technologies of the late 1980s. We need to find ways to incorporate cultural as well as scientific perspectives in what we teach. After all, environmental problems are primarily cultural problems not scientific ones. So, let's expand our knowledge and sharpen our commitment to inquiry, as we refine our pedagogy. New knowledge and teaching methods are at the heart of the program of this conference. Please take advantage of the many opportunities the program provides, enjoy the association with old and new friends and colleagues, and let's experience another step forward for NAEE in Quebec--la belle province. Thank you.

FREE TRADE IN ENVIRONMENTAL EDUCATION
POUR UN NOUVEL ESSORT DE L´EDUCATION RELATIVE A L´ENVIRONMENT

Pierre-Jules Lavigne, President
l´Association quebecoise d´interpretation du patrimoine
Charlesbourg, Quebec

Mister president of NAEE, mister conference chairman, bonjour mesdames et messieurs, good morning ladies and gentleman.

I would like to welcome the NAEE and all of you from various countries to the 16th conference in environmental education held here in Quebec City.

We are pleased that the North American Association for Environmental Education has chosen Quebec City, the first city in North America to be selected by UNESCO as a World Cultural Heritage.

This exceptional conference will certainly bring about a new future for environmental education in this part of North America.

Your host this week, l´Association quebecoise d´interpretation du patrimoine (AQIP) is co-sponsor of this conference. The words "interpretation du patrimoine" means "heritage interpretation." Our association promotes the appreciation of the natural, cultural and historical heritage of Quebec province.

The basic purpose of interpretation is to discover man´s place as the integral part of nature. Interpretation seeks to convey to the public the meaning and the importance of a heritage by directly involving individuals with the phenomena so as to make them more conscious of their place in the environment.

In this way, the population touched by the work of our members will become more and more aware of and concerned with their own heritage. But now, in 1987, we all know that trying only to protect samples of that heritage is no longer sufficient. We have to add to that philosophy a new way of managing the whole environment. All the processes of economic management must be complementary to environmental management needs.

Human beings are always trying to improve their standard of living. Therefore it is easy to convince people that the quality of the environment also means the quality of their own lives.

Government agencies can come out with some fantastic figures: they announced, here in Quebec, that 80% of the population is ready to subordinate all economic development to environmental management.

This reflects that our society is very much preoccupied by the future of its environment. However this does not necessarily mean that the population is indeed well educated yet. It might simply mean that our society is probably now more receptive to further environmental education...ready to adopt new economic behavior.

The "challenge ahead" in environmental education is to find ways to reach new audiences. It implies also a tremendous effort in presenting, interpreting, interconnecting new ways in the use of our natural resources and environment throughout all the economic sectors of our society.

But, I feel strange, even nervous when I see on one hand, society ready for environmental education, while on the other hand, many educators having that deep feeling that even after one or two generations of environmental education, all the bigger tasks are still in front of us.

Are we ready to reach "excellence in environmental education"?

L'AQIP hopes that this conference will bring to all of you that acceleration of momentum for the real challenge ahead.

As you know many people speak French here in Quebec: 4.5 million. But you will be surprised to learn that 15 million people speak French in North America. Almost two-thirds of them live in the States. We invite you to establish strong contacts with the French speaking people of Quebec during this conference. If the target of environmental education is to reach all the North American people, we all know that we shall contact them through their culture, their language and then their behavior. As we look for some very important links with the North American people, let's try to find a "free trade"

agreement between environmental educators. Now, if you please, I will follow up in French.

L'Association quebecoise d'interprétation du patrimoine (AQIP) souhaite une cordiale bienvenue a tous les participants de cette conférence. Nous nous rejouissons enormement de l'importante participation francophone a cette premiere conférence nord-americaine sur l'éducation relative a l'environment en terre quebecoise.

Vous trouverez ici des personnes provenant de huit pays et oeuvrant dans des domaines aussi diversifies que les milieux muséologiques, zoologiques, centres d'interprétation de la nature, les divers qaliers de gouvernements, l'industrie, les chercheurs et professeurs en milieu academique, collégial et universitaire, et finalement, les éducateurs des écoles primaires et secondaires.

Tous ces gens sont regroupes dans l'Association Nord-Americaine pour l'Education relative a l'Environnement (NAEE) afin d'y retrouver une analyse et une compréhension des problèmes écologiques et d'en promouvoir des solutions opérantes.

L'AQIP s'est associée il y a plus d'un an et demi a la préparation de cette conférence en éspérant susciter chez nous un essort inegale face a l'éducation relative a l'environnement. Nous désirons susciter également l'établissement de liens importants entre les Quebecois et le reste des individus impliques dans le processus de l'éducation relative a l'environnement a l'echelle de l'Amerique du Nord.

Vous Vous dites sans doute: Qui est l'AQIP?

Bien, c'est une association existant depuis plus de 10 ans et qui oeuvre a la promotion de la mise en valeur du patrimoine naturel, culturel et historique au Quebec. L'AQIP regroupe plus de 120 membres repartis dans les secteurs privés et publics, soit les divers paliers de gouvernements, centres d'interprétation de la nature, ecomusées, centre d'interprétation historique et maisons d'enseignement.

Une deuxieme question que vous vous posez sans doute: En quoi l'interprétation est-elle liée a l'éducation relative a l'environnement?

L'intention profonde de l'interprétation est de faire découvrir la place de l'homme en tant que partie integrante de la nature. L'interprétation vise a communiquer au public la signification et la valeur du patrimoine, en impliquant directement l'individu avec les phénomènes qui l'entourent pour le rendre conscient de la place qu'il occupe dans son environnement.

L'état de l'environnement ne commence qu'a être mesure et défini. Les premiers résultats qui nous parviennent nous indiquent ce que plusieurs d'entre nous anticipaient depuis déjà une génération ou deux:

-- Nous outrepasson la limité d'un développement durable.

-- Nous constatons une détérioration croissante de la qualité du milieu que nous devons un jour léguer a une population encore plus nombreuse et exigeante.

Naguère, nous avons sans cesse chercher a améliorer notre qualité de vie sur le plan économique. Mais, de plus en plus de gens s'aperçoivent qu'une expansion économique durable ne saurait s'operer sans une gestion avisée de l'environnement.

Mais, entre s'en aperçevoir, l'admettre et effectuer les changements necessaires, il y a une période de transition qui necessite, a l'échelle des divers secteurs de notre économie, l'intervention de l'éducation relative a l'environnement.

Que l'on songe aux agriculteurs, aux forestiers, aux pêcheurs, aux usines de transformation, aux usines de production, a tous les niveaux, nous devons présenter, interpréter, interrelier de nouvelles façons d'utiliser notre environnement.

Depuis plus d'une ou deux générations, plusieurs parmi vous sont impliqués dans ce processus d'éducation relative a l'environnement. Et nous sommes obligés de constater que face a des processus de transformations économiques tres complexes, l'éducation relative a l'environnement, bien qu'encore loin derrière, doit immediatement avoir la prétention de reussir a imposer des solutions a des problèmes écologiques tres importants.

Et c'est la que le thème de la conférence prend toute sa signification: "Point de mire sur l'éducation relative a l'environnement: un élan vers le futur".

Sommes-nous prêts a atteindre ce niveau de performance? Chercheurs, éducateurs, interpretes pourront ici, durant cette conférence nord-americaine, trouver de nouvelles approches et échanger afin de repondre plus adéquatement au defi que nous avons tous accepté de relever.

Merci et bonne conférence à tous!

Thank you and have a fantastic conference!

WELCOMING REMARKS

Therese Laferriere, Dean of Education
Laval University
Quebec City, Quebec

Monsieur Berberet, président de le North American Association for Environmental Education, mesdames et messieurs du comité organisateur, mesdames et messieurs qui participez à ce colloque, enchainant a le suite de monsieur Pièrre-Jules Lavigne de l'Association du Patrimoine de Quebec, il m'est fort agréable, au nom de mes collègues de la Faculté des sciences de l'éducation et de l'Université Laval, de vous souhaiter la plus cordiale des bienvenues.

Bienvenue au Quebec, si vous ny demeurez pos.

Bienvenue au vieux Quebec.

Bienvenue en ces lieux ou vient de débuter le 16 congrès de l'Association nord-americaine pour l'Education relative a l'environnment (NAEE).

Mister Berberet, members of the local arrangements sub-committee, ladies and gentlemen, Welcome to Quebec City!

On behalf of my colleagues of the School of Education, de l'Universite Laval, I am most pleased to welcome you at the North American Association for Environmental Education 1987 Conference.

The Executive board of l'Universite Laval has recognized the NAEE conference and we are honored to contribute to its realization by co-hosting it.

Deux personnes de la Faculte des sciences de l'education sont membres du comite-hote de ce congres, la professeure Lucie Samson-Turcotte et la professeur Jean-Guy Bernard.

Les deux assument la responsabilite de l'organisation audio-visuelle de ce congres. L'Universite Laval met gracieusement a la disposition des participants et participantes la majeure partie des appareils audio-visuels, ainsi que les micro-ordinateurs qui seront utilises durant ce congres.

The two teachers from our University who are members of the host-committee are: Professor Lucie

Samson-Turcotte and Professor Jean-Guy Bernard. With the approval of the authorities at l'Université Laval, they have accepted the responsibility for gathering the necessary audio-visual equipment. Knowing the quality of what they do, I am sure that they have left no stone unturned in providing assistance to the presenters.

Nous sommes particulièrement heureux de nous associer a l'organisation de ce congrès étant nous-mêmes impliqués dans la formation d'éducateurs competents en éducation relative a l'environnement. En effet, notre faculté offre un programme de maîtrise en didactique avec une concentration en éducation a l'environnement. Selon nos informations, nous serions les seuls au Quebec a offrir un programme d'études avancées dans ce champ du savoir. Il y a bien sur des programmes universitaires ayant trait a l'environnement mais aucun autre en éducation a l'environnement.

L'idée même d'une telle concentration a germe lors du "First National Congress for Environmental Education Futures", tenu a l'Université du Vermont (University of Vermont) en aout 1983. Nous savons que votre Association a eté co-sponsor" de ce congrès.

The "guiding principles for environmental education defined by NAEE" ont ete une source d'inspiration dans l'etablissement du cadre de reference de cette concentration. C'est un exemple que vos travaux ne restent pas sans lendemain...Nous vous sommes reconnaissants pour ce magnifique travail accompli!

We are pleased to be co-sponsoring this conference. Here at Laval, we are also involved in the venture of Teacher Education as it relates to environmental questions and issues.

At our School of Education--and we are the one to do so in Quebec--the education of teachers and researchers is recognized as a specific domain of study, leading to a Master's degree.

You may be interested in knowing that this Master's degree program idea was born at the "First National Congress for Environmental Education Futures", which was held at the University of Vermont in August 1983. NAEE was then co-sponsoring this event.

In the development of this program, we have drawn from the "guiding principles for environmental education defined by NAEE". Thank you for this contribution.

I am personally most interested in your wholistic approach to environmental education to study and comprehend environmental problems and issues. And I strongly support your basic orientation in elementary and secondary education, that is, to provide a teaching-learning environment which relates environmental knowledge, problem-solving, values and sensitivity.

Also, let me add that I thoroughly enjoy reading your statement, and have adopted it:

"To think globally, and act locally!"

Through elementary and secondary environmental education programs, you contribute to the development of the citizens, teachers, and managers of tomorrow. Hopefully, they will demonstrate:

-- a heightened awareness of environmental issues;

-- a capacity for critical thinking, and problem-solving skills;

-- a willingness and a capacity to devise effective solutions and bring about policies which will be, as you say, ecologically sound.

L'education a l'environnement considère l'individu dans so réalite totale. La poursuite de son developpement integral prend en compte la considération qu'il est partie integrante de l'environnement et facteur d'équilibre de cet environnement. L'environnement est envisage dans une perspective holistique.

Dans la formation en éducation a l'environnement offerte a Laval, 5 secteurs clefs sont compris, soient:

-- l'environnement,
-- l'éducation a l'environnement,
-- les méthodes at les techniques de l'éducation a l'environnement,
-- les strategies d'implantation d'un programme d'éducation a l'environnement,

-- les procédes de recherche en éducation a l´environnement.

Reflecting on the "back to basics movement" that is currently in vogue, my colleagues and I agree that the real basics might very well be our understanding of those fundamental mechanisms which govern our life on this planet, and our learning of more harmonious ways to be with nature. Being aware of this, the mastery of the three R´s pales in comparison. Thus, l´Université Laval is joining with your association´s efforts to help the next generation to live in harmony with the basic mechanisms of this planet.

Plusieurs parlent d´un retour aux "basics" en milieu scolaire, soit la concentration des efforts sur l´apprentissage de la lecture et de l´écriture et l´apprentissage de l´arithmétique. La compréhension des mécanismes fondamentaux qui régissent la vie sur la planète et l´apprentissage d´une vie plus harmonieuse avec la terre nous apparaissent comme les "real basics". Sans cette compréhension et sans ces actions positives il n´y aurait plus a long terme--devrait-on dire, a moyen terme--de "basics". En ce sens, la Faculté des sciences de l´éducation de l´Université Laval est heureuse de s´associer aux efforts de votre Association en vue d´aider la génération montante a vivre en harmonie avec les mecanismes qui rendent la vie possible sur la planète. Bon congrès!

You have chosen to meet in an environment that holds a great deal of history, and is rich in tradition. Chateau Frontenac and l´Universite Laval respectively stand out in this respect.

Please allow me a few words on l´Universite Laval.

Laval is the eldest French speaking University in North America! One block away from here, you will find the original site of l´Universite Laval. In the late fifties it has moved west, three miles from here.

L´Universite Laval is now a community of over 35,000 people who study, work, teach, and research. The present campus encompasses 25 buildings, many of which are also related through underground tunnels.

Attuned to natural and built environments as you are, I thought you might appreciate a few light comments such as the following ones:

- -- Some of my colleagues engaged in Teacher Education walk the woods of Laval U., in the winter, with snowshoes on, as they introduce their students to the teaching of the wonders of our natural setting! They might cross your path in the coming days...
- -- Whenever you are in need of some fresh air, visit l'Universite Laval, as we are located on the highest land in the nearby area. Be sure to take this breath of air outside. Once inside the buildings, in particular the School of Education, you are once again faced with those everyday problems which are sure to pollute the air.
- -- Looking forward to this conference, and coming all the way up here, you probably have wondered "How cold is it going to be up there? You might have come overly prepared...

Back on the serious side, I want to emphasize that, as charming as Quebec city may be, it has its problems too:

- -- the waters of the St. Lawrence are far from being clean!
- -- heavy metals are contaminating our waters...
- -- our maple trees are endangered by acid rains; we know you know that, and we are thankful for your help!

Many of you here are much more competent than me to discuss these issues.

As a final word, I want to say that I am convinced that your networking can only be beneficial to all of us.

Have a good conference!!!
Have a good stay at Chateau Frontenac!
Enjoy the food...
Walk everywhere you wish; our streets are safe!
And, if birds are part of your life, go visit the snow geese!

THE ENDANGERED PHOENIX
LESSONS FROM THE FIREPIT

Charles E. Roth
Director of Educational Services
Massachusetts Audubon Society
Lincoln, Massachusetts

It sustains us all--whatever our race, creed, nationality, political persuasion, or even our species. Aldo Leopold called it "the land;" James Lovelock, and the early Greeks refer to it as Gaia; Native Americans knew it as Mother Earth; many scientists describe it as the biosphere. By whatever term it is known, it provides all the conditions for life and we are all living integral parts of life itself. It is the "environment" we refer to in the term "environmental education."

It is difficult to conceive of anything much more basic about which to become educated than an understanding of how the systems of life function and how we humans fit into them. However, because we are so intricately enmeshed in the multi-dimensional, multi-faceted tapestry of the environment it is apparently easy for a majority of people, including educators, to take it for granted. In addition our culture's strong tendencies to anthropocentrism tend to put additional blinders upon our educational leadership. The end result is that environmental education is generally relegated to a minor role, if any, in most educational programs.

There is nothing new in all that. Spokesmen for putting education about the relationships between people and nature to the forefront of education have been around essentially since the beginning of civilization. Whatever the culture, it seems there have been those who spoke for better understanding of relationships between people and the natural system in which they were embedded. Sometimes these visionaries spoke out through religious systems, at other times through secular writings and educational programs. But rarely have their views been widely accepted into mainstream areas of the culture.

Instead a spectrum of other views that more comfortably addressed human dreams and insecurities held sway. Despite considerable diversity, most of these views share in common a strongly anthropocentric world view and a disregard, if not outright contempt, for the natural world and its intricate, complex life support systems. When human populations were relatively small and widely scattered, the negative impacts of the consequences of such human behavior were slight and local and the redundancies and scale of the global ecosystems made them relatively forgiving of such trespass.

But times have changed. Today human populations are extensive and concentrated. Negative impacts are increasing and intrusive into some of the most fundamental functions of what has been an essentially self-regulating global environmental system that fosters and is fostered by its myriad forms of life. And of course, the rate at which such changes are occurring is apparently without precedent in the history of life on this planet. It's a change rate in excess of that required for many ecosystems to adjust their self-regulating mechanisms through normal evolutionary processes. The overall set of systems inevitably is becoming less forgiving.

Regardless of the form of a human culture, today the future ability of the planet to sustain that culture depends upon the culture's ability to maintain in a healthy state the natural systems of its geographic locale. Whatever forms of cultural diversity may be displayed in terms of language, art, technology, and the like, the culture must maintain the integrity of its region or pay increasingly severe penalties, including even its own destruction. Furthermore, environmental degradation can seldom be contained to a region. Because the various ecosystems of the regions are open systems and linked to adjacent ones, to abuse one system is ultimately to abuse them all.

Cultural diversity gives rich flavor to humanity. It must be preserved. As with the lumps of meat and vegetables in a good stew, the cultural lumps give character to the totality of humanity, but in a good stew the lumps share a common broth. For us that common broth is a healthy biosphere and that can only be achieved through healthy ecosystems around the globe, a situation we do not enjoy at present. Culturally, it would appear that the common broth has to come from environmental education at the core of each culture's multi-faceted education system. In the real educational system schooling is only one component: it is a system that includes the family, the media, the community, religious groups, various interest groups such as scouting, clubs and the like, and even the workplace. For educational messages to become normative in a society, the individual has to be receiving them from several segments of the system, not just one.

To effectively nurture a culture, or mix of cultures, the common educational broth must include a rich blend of positive feeling for, and understanding of, the complex systems of life that result in moral, ethical guidelines that foster activities that maintain and restore every area's capacity to sustain life in diverse ways. That such a need, indeed demand, strikes to the heart and core of each culture is clear. That the attempt must be made, and vigorously, there should be no doubt. That it can be achieved is less clear. But there should be no doubt that organizations such as this and its sister groups will have to face the challenge and reexamine priorities and strategies.

We need to face the fact that we have to become more radical. Radical, not in the sense of wild-eyed, crazy viewpoints, but in the sense of returning to roots, which is what the word truly means. We are rooted in the system of life, all of us, and whatever else we may be or do, we had best take care of that system first and foremost. Only then can we safely and reasonably take on other ventures. We must help the educational establishment realize that reading, writing and arithmetic are only tools, indeed only some of the tools, for understanding the natural systems that sustain our diverse lives. Throughout history there have been numbers of cultures, indeed many Native American ones, that have possessed better understanding of the living systems and their place in them than ours does, yet have been totally unfamiliar with the so-called basics of the 3R's.

Daily, intimate contact with living systems encourages, but does not guarantee, feelings and understandings of our total interconnectedness with natural systems. In a continual chicken-egg dilemma, minds must be prepared to perceive and accept such connections and their implications. Liberty Hyde Bailey fostered the nature study movement at Cornell in hopes of preparing the minds of rural people to see the benefits of life on the land and thus stem the flow of farm children to the city. But, despite the nature study movement that he fostered, many still moved away and, within the homocentric environments of the cities, became even further removed from the steady flow of messages of connection to living systems. The urban world stimulated many new things in people and provided basic sources of support for their very lives and dreams and encouraging them to deny their reliance on any aspects of nature save their own species' mental uniqueness. The educational institutions became willing contributors to the process of blinding people to their fundamental roots. They replaced the roots with glorious myths--myths of superabundance of resources, of humankind's special uniqueness apart from the debased world of other living things, of a world created only for human use, of a world without limits. Such are the myths from which dreams are made and dreams are more fun than realities. But realities denied can hurt, even maim, kill, or annihilate. Our educational system has for too long been fostering dreams, it must also educate for realities.

At a time when America is looking hard at education--what it is and is not doing for its people--the time is ripe for environmental educators to move aggressively into the dialogues and help the public and the educational establishment see how the ideas environmental educators have been wrestling with can be incorporated into the very core of a revamped educational system that can appropriately serve our people and nations in the years ahead. This involves not only gaining understanding about the living system of nature but the fostering of strong positive self-concepts and a sense of community that allow people to act positively in relationships with other people and the natural world. Education must not be confined to helping people make a living but must also help people to live rich, satisfying lives. Education can help people foster the beauty that is a result of the basic order that exists in Nature, and order which requires continued investment of energy to maintain. Presently it appears that much of the activity of our lives is committed to entropy, that breakdown of the order that creates natural beauty. Any reformed educational offerings of necessity must counter that trend with long term financial and moral support. The ultimate goal of our educational systems must be a citizen that lives all facets of life in a manner that is humanly successful yet ecologically sound.

Why so? Simply because the quality of our environment is essentially the net sum of the consequences of individual and corporate actions. These actions are the direct result of our individual activity as producers, consumers, recreators, *procreators*, and voters. It is important that as broad a segment of the population as possible be capable of, and willing to make enlightened choices. In a broader sense, the quality of the biosphere as a whole, or any of its component ecosystems, is the net sum of the consequences of the actions of the populations of the component organisms on each other and the physical environment. We are all in the system together and each species' follies and fortunes have their impacts on all the rest. Effective educational programs need to see that this reality, and its implications for our lives, is clearly transmitted to all people.

Despite the fact that environmental education currently exists as a discrete entitity, it will become truly successful only when it disappears as such through incorporation of its precepts into the basic fabric of elementary and secondary education, the core studies of post-secondary liberal education, even continuing adult education. At first reflection this suggestion may appear unrealistic, but nothing less will lay the proper foundations for a citizenry that can continue to successfully survive and thrive within the ecological constraints of this planet. Such a general education core constitutes the base of true, universal environmental education, the first line of investment in a future.

In the forest of education, the time has come for environmental education to make a successional move from being a rare, though attractive, little understory dweller to becoming a dominant in the forest community. Throughout much of America's history, environmental education, and its intellectual antecedents, was a mere seedling expanding its philosophical root system but gaining little height in the intellectual forest. In part this was because its development was often set back by the anti-environmental forces of greed and ignorance in society. However, in the late sixties and the early seventies EE was able to make a growth spurt--but it is still far from being a dominant in the forest. Indeed, in the eighties it may be facing a period of ultra-conservative drought that is arresting its development again.

The intellectual seedling that was to become environmental education struggled for its existence in the shadow of a number of dominant societal ideas that have fostered the extensive disruptions of living systems throughout the world, disruptions that were apparent to a great many people by mid to late 20th century. These environmental disruptions changed the intellectual climate and setting the stage that led to the EE growth spurt that has been alluded to.

The basic need for environmental education has always been present in society. The problem has been to get people to see its value and necessity and to give it appropriate priority. While the impacts of environmentally degrading human activity remained relatively small and dispersed, they tended to remain unperceived, except by a handful of particularly sensitive and perceptive individuals. Thus requests to educate about what was happening to the Earth, and ultimately to us as well, seemed to most people in western societies frivolous at best.

Ironically, it often takes the presence of a life threatening disease, such as cancer, to get a person to stop and examine life and come to grips with what is truly important and what is not. Similarly it may be that the more extensively life threatening disease of environmental degradation may be causing significant numbers of people to stop and examine where our society is heading and determine what things are truly important and which are not. Perhaps the growing communal awareness of the increasing ill health of our environment will lead to growing support for environmental education as a core of our overall general education efforts.

Achieving effective EE will have to involve the majority of the very loosely articulated components of the real education system mentioned earlier. In addition we have to get people to understand that you don´t necessarily have to be a nature lover to be concerned about the health of all living systems. Love of nature is a powerful, positive force for working to conserve the living systems, but so is self-interest. Since we are all truly embedded in a more comprehensive living system whose health ultimately affects that of all of us and our offspring, we had best work to see that this system stays healthy so that we can also. In stark reality, we are parasitic on the megasystem and we need to heed the cautionary biological insight that successful parasites get their needs met without weakening the host, for if the host becomes ill or dies, they die also.

The living system of Earth is only a more comprehensive synergistic collection of subsystems than the collection of subsystems represented by our bodies. There are many comparabilities between the two systems even though they represent different orders of magnitude. The health of both can sometimes be restored by specialists making considerable investments of energy, time, and skill. In both cases this represents great expense both in the direct investment and the redirection of materials and energy that might be expended elsewhere. Preventive medicine is a saner route. Investment in environmental education is just such preventive medicine. The larger the numbers of environmentally literate citizens in the human population, the greater are the chances that the living systems will not be stressed to the stage of biotic ill health and impairment, that is, the net sum effect of human activity may be positive for the general living system.

If the populace at large is trained in ways to prevent or limit ecosystem stress and to apply basic environmental first aid when symptoms first appear, then environmental specialists will be freer to work on the worst cases to restore badly damaged ecosystems, and in time perhaps we can look forward to human societies living a diversity of satisfying lives on a very healthy planet. We need to sharpen our capacity to use the bounty of the living system without making it ugly or destroying its many self-regulating processes. Societies need to restore to the forefront the legal concept of "usufruct"--that is, the use of the benefits of a property without altering or changing its basic capacity to generate those benefits. In economic terms it means living within the "interest", or surpluses, of living systems and refraining from consumption of ecosystem capital. Living systems cannot long persist on a credit card economy that benefits one species in the shortrun while bankrupting most of the rest.

To achieve such reversal of societal trends, we will have to train not only specialists but average citizens that have the critical thinking skills, sensitivity to the environment, and courage to set the ethical standards for judging the pronouncements and recommendations of experts and technicians. Effective citizens must not accept those recommendations if there is good reason to believe that their consequences would generate significant ill health in the living system or important components of it. Simple as that may sound, it involves a great deal of basic information along with an alertness to expanding knowledge and a willingness to apply that knowledge through the guidelines of an ethics. That must become an imperative of good citizenship. We need to build a new patriotism, a patriotism first to Earth, then to whatever nation is our home address. Earth First is an ethical guideline that in the long run is also in our own best interest as a species.

Just as many children rebel against their parents at some time or other, for the past couple of centuries humankind seems to have been rebelling against the parent biotic system, Mother Nature if you will, as blindly as our children rebel against us. In time our children usually change and acknowledge the appropriate wisdom they have earlier denied. The time is overdue for humankind to cease its adolescent, ego centered ranting against the planetary parent and develop a mature grasp of its integral, yet important role in the overall system of life.

Because Earth is such a complex, synergistic entity, as parts of the biosphere are lost via extinction, the whole being subtly changes, just as we change as we age. However, if the parts are lost rapidly, over a relatively short time, the changes are less subtle and, under external stress, the whole entity could collapse or be weakened beyond recognition. Unfortunately our species has the capacity, and indeed is exercising it, to bring about such rapid reductions in the components of many of our ecosystems. That sets the stage for disaster, even as the systems continue to limp their way through time. And we must not limit our attention solely to life forms, per se. We must avoid excessive build up of insulating atmospheric gases generated from combustion that can warm the climate that in turn leads to changes in ocean circulation that can induce new and untimely glacial periods; and we cannot continue pouring gaseous hydro fluorocarbons into the atmosphere that interact with ozone and interrupt the ozone layers capacity to shield us and other life forms from highly damaging radiation from space.

Life in bacterial form gave rise to the ozone, which in turn provides the protection from radiation that permitted life to come out from beneath the protective surface of the land, adapt, and expand its coverage of the planetary surface. The bacterial microcosm also created the carbon dioxide/oxygen relationships that sustains most life today. Self-regulating systems evolved that keep many key environmental relationships reasonably constant. Our activity of late, however, is adjusting the relationships in ways that tend to disrupt the self-regulating, life sustaining cycles and systems. We seem engaged in a potentially dangerous game of Jeopardy in which the sum of our seemingly innocent, day to day activities are potentially every bit as deadly a threat to Earth as potential nuclear holocaust, perhaps more so, because it is harder to focus people's attention on them.

The Egyptians had a myth of a great and beautiful bird called the Phoenix. This bird lived for 500 years, then it set itself on fire and burned to a pile of ashes. From those ashes emerged a brand new phoenix as beautiful as its predecessor. This bird, sacred to the god Osiris, became the symbol for immortality. Throughout history people have sought the phoenix and what it symbolizes. But the phoenix has remained elusive--an endangered species. Occasionally people have found clues that led them to proclaim that such immortality was possible and a broad segment of the populace have wished to believe in the phoenix and what it symbolizes even though hard evidence has been impossible to come by. Those who live with the myth of the phoenix seem to feel that even if we destroy ourselves we can rise from our own ashes as gloriously beautiful as in the past.

The Greeks on the other hand believed in the Earth as a living entity, as did a number of other early cultures. The Greeks called this entity Gaia or Ge. This was long considered a myth as well. But as we learn more and more about the evolution of life on Earth and the complex operations of this planet, particularly in comparison to other planetary neighbors, the evidence increasingly supports earlier intuitional belief in Earth as a self sustaining living entity. Its self sustaining systems must remain intact for there is no evidence that Earth, like the mythical phoenix, can arise from its own ashes as beautiful as before, although Earth has survived several mass extinctions in past eons and, in a phoenix-like way, the DNA of the surviving life regenerated new, long lasting life forms each time.

We need to learn to accept our place as a fascinating subsystem of a beautiful planet and self-regulate our species so that we do not become the spark that ignites a self immolation of Gaia, for Gaia is no phoenix. Gaia would not arise from the ashes as beautiful as it is at present. At best it might retrogress to the dawn of life when bacterial mats were the dominant life forms and the developers of the basic life processes of Gaia, but it is just as likely that Earth would become as lifeless as its sister planets of this solar system.

Organized environmental education has a major task ahead to initiate restoration of the revitalized myths of the Mother Earth, Gaia, or whatever pseudonym is most appropriate for the idea that the surface of our planet itself is a complex living system in synergistic relationship with inorganic components of the planet.

People need to be brought to a full awareness that they are part of something far larger than humanity itself. While most western religions regard humans as less than God, they still perceive mankind as greater than other species and nature in general and the fallacy of humanism has been that it puts people clearly at the center of the universe. Meanwhile, intuitions, held by a variety of less dominant cultures, of people as part of a greater system of life in nature are being confirmed by revelations of scientific investigation in a number of fields--ecology, molecular biology, biochemistry, climatology, oceanography, to name a few.

This deflates our widespread anthropocentrism. However, it is worth noting that such species centrism is not unique to humans just because they can articulate it. Most, if not all, species operate to expand their space and influence within the corpus of the biosphere. Only the complex, self-regulating processes of the planetary ecosystem prevent the various species from succeeding in this too well and disrupting the various component ecosystems. The curse of mankind, it would seem, has indeed been the biblical one of eating the fruit of the tree of knowledge, for by developing aspects of knowledge we have learned how to circumvent some of these self-regulating mechanisms, something other species have not learned to do. In so doing, we have developed the ability to become a cancerous tumor within the body of Gaia. Indeed, some might suggest we have already metastasized in the system.

The key to a remission, it seems to me, lies in further use of the fruits of knowledge to develop cultural self-regulation of our species in ways that reduce our negative influences and restore our position as a positive component of a healthy Gaia. Education is the key to accomplishing this, education that develops in us a self awareness of our place in the healthy Gaia and helps us find ways to express the other capacities of our species, and of individuals within it, without jeopardizing the health of the planetary living system.

For everyone, survival is primary--food, water, shelter from adverse elements are first needs. Until these are secured we cannot explore adequately the other potentials of either individuals or the species. Provision of these basics is only possible equitably, and for the long run, from healthy systems in a healthy biosphere. Education to achieve this for humans, whether called environmental education or something else, must become Priority One now, not years from now. In the 1970s, our American Commissioner of Education called EE "Education That Cannot Wait," yet it continues to languish in most places.

Congressman John Brademus had stated even earlier that "to make substantial progress in meeting our ecological crisis, we are going to need a citizenry informed and educated about the whole spectrum of issues called environmental." It was a correct call yet as a society we remain a long way from truly addressing his challenge.

In 1975, John Disinger suggested, quite accurately, that "Commitment is what has been, and is, lacking." A dozen years later that statement still holds and is further complicated by general lack of real commitment to education among the public apart from what Leopold referred to as "letterhead pieties." In all fairness, in the past several years there has been an honest surge in interest and commitment to general education but by and large the commitment to a strong environmental component of the education is lacking.

The challenge lies in retooling an education system, particularly a schooling system, which was not designed for effective environmental education. Our current system is one in which:

-- a majority of educators have been inadequately trained for the task philosophically or substantively;
-- critical thinking, basic to good environmental education, has been inadequately encouraged;
-- emphasis on group control tends to fragment systems thinking;
-- reductionist, analytical approaches to material are emphasized almost to the exclusion of strategies and skills of synthesis of information.

At the root of much of this is a general curriculum organization that tends to overly fragment things and place them in arbitrary, often outdated, disciplinary compartments. In such a system, inclusion of environmental education is generally seen as an attempt to add something new to an already overly full pot. It is difficult to persuade the people who designed the pot and chose the ingredients to see that with some creativity and redesign they can create an even better intellectual stew with even greater nutrition and capacity to nurture society. In many ways our education system has been as lax in effectively modernizing its curriculum and instructional strategies as the American auto industry was in modernizing itself a few years back.

A Nation At Risk, the relatively recent critique of American education, notes that the nation makes a promise to its citizens that "all, regardless of race or class, or economic status are entitled to a fair chance and to the tools for developing their individual powers of mind and spirit to the utmost." When education fails, we negate that promise to our citizens. That is a tragedy, but equally tragic is that it also means that we grow another generation whose environmental ignorance will degrade the Earth and further impair opportunities for the next generation to have a world in which the nation's original promise could be fulfilled.

It is interesting that the authors of A Nation At Risk suggest that "knowledge of the humanities must be harnessed to science and technology if the latter are to remain creative and humane, just as the humanities must be informed by science and technology if they are to remain relevant to the human condition." Unfortunately, the authors appear unaware that that is precisely what environmental education is all about. Certainly they make no appeal to educators and the public to bring environmental education into the picture, let alone to the forefront.

I have led us through this perhaps overly rambling preface in order to stimulate further thinking about importance of environmental education in society and about our need to make it a professional priority over the next decade or so to bring the general public and the educational establishment to a strong awareness of EE's critical importance in developing our citizenry to its appropriate potentials. For a moment, though, let us briefly review where we in EE have been and what we have become.

The intellectual roots of environmental education reach deep into our history and the movement has developed by accreting intellectual DNA from many sources including other similar organizational movements such as nature study, conservation education, outdoor education, experiential education, and the like. In addition it has added some new twists all its own. EE, as such, essentially developed its own identity from ideas generated at a series of conferences held in the mid-1960s. Its early growth was phenomenal, for within little more than a decade it had become a world wide movement, albeit a somewhat modest one. It has generated at least one continuing professional journal; a worldwide newsletter; a professional organization or two; a number of other organizations devoting significant concern to environmental education interests and the alliance of some 30+ of these into an organization; some academic courses and programs focused on the subject; and professional degrees in it. At one point, the U.S. even had a National Environmental Education Act and a federal Office of Environmental Education. A number of states had at least part-time coordinators of environmental education, a few of which are still in place. One state even has an EE requirement for teacher certification. In other words, we can exhibit for environmental education, in at least a modest fashion, many of the conventional trappings of success. Yet much of the public neither knows we exist nor feels the need of our services.

As an idea or movement EE has passed puberty, even endured some rites of passage. It is not difficult to spot some of the cocky, self-sure attitudes in the profession which are prevalent at the adolescent stage of many individuals and organizations. But, as with the developmental tasks that face individuals of two score plus years in our society, the tasks which lie immediately ahead for environmental education would appear to be career development and mate recruitment. For EE the career development task is to clarify the directions we must take to be fully recognized and respected in society at large. The mate recruitment task involves the courtship behavior that may wed our environmental and educational perceptions to those of society's educational leadership. We already have many of the basic skills needed to make the marriage work, what we need now is to find the words and approaches that will make our suit clear, appealing, indeed irresistible to our potential mates.

There is a strong tendency for those engaged in environmental education to be much more strongly versed in the environment than in education and to be more involved in the politics of the environment than the politics of education. And by education I mean far more than schooling. This has been one of the major factors that has restrained the advance of environmental education, in North America at least. We must all become involved in more than the technology of instruction and look at the politics of how ideas are included in the basic core of true curricula--that is, the basic ideas and concepts with which learners will be encouraged to wrestle during their involvement with educational programs at all levels and both formal and nonformal.

One way or another we are going to have to get as involved in the politics of education as many have already been in the politics of environmentalism. We will also have to make environmental advocates a party to our suit, getting them to understand that environmental education itself is as much of an environmental issue as pollution. Environmental advocates have a tendency to get lost in what they perceive as immediate pressing issues and claim that they don't have time to work on more long range issues. We have to help them see that lack of general environmental education means a populace that is continually generating environmental brushfires and undermining earlier environmental progress. Lack of environmental education is thus good for their job security but defeats their basic mission.

I would specifically like to challenge this organization to set some professional priorities that address the issue of gaining widespread acceptance of environmental education concepts and strategies as part of society's general education core; priorities that go beyond the professional growth needs of our members; priorities that are the synergistic result of the unique perceptions of each of the three Sections that compose this organization. I would like to see us focus on approaches to getting out the message of societal need for "education that is environmental" to the educational community and the public in a clear and forceful way. It should be done in as timely a fashion as possible so that it is a real part of the educational reform dialogue that is currently in progress in North America.

The mythical phoenix was able to rise from its ashes because the fire was great enough to leave some live coals that could spark a rebirth of the fire of life. As environmental educators we have all been active firemakers. We go about creating little piles of educational and emotional tinder and setting them alight. Then we tend to go off and start a new fire elsewhere. All too seldom do we return in time with kindling and logs to fuel the little fire we have started or to pull all the little flames we have triggered together to reinforce one another. Fire building is just what it says, a building process and that is both a science and an art. Piling up a random set of tinder, kindling, and logs in a haphazard way, lighting it, and walking away seldom results in a good fire. A good fast starting, long burning fire needs to be carefully designed. You begin small with dry tinder and kindling then add fuel carefully selected for size and quality and placed in ways that allow good draft.

Building the fire of demand for environmental education in society takes no less care. Building such a fire begins with the kinds of priority setting and planning that can happen at a conference such as this and draws upon some of the fine programs that have been developed over the past few years. Of course the effort can only begin here, it must be sustained. Recall Disinger's observation: "commitment is what has been, and is, lacking." We need to make that statement untrue for the future.

NATIONAL NETWORK FOR ENVIRONMENTAL EDUCATION

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Project Description

Abstract. A wealth of environmental education materials and programs have been developed and implemented over the last 15 years, but no central coordination and dissemination mechanism exists. As a result, environmental literacy, and the consequent ability of the public to make informed judgments on environmental concerns, is uneven. To answer this deficiency and to broaden community participation in environmental education, the Alliance will establish a National Network for Environmental Education. The Network will consist of interactive environmental education centers. Existing centers will be invited to join the Network. Where none exist, new centers, based at colleges and universities throughout the country, will be developed. These centers will provide expanded community-based environmental education programs aimed at both schools and the general public. The Alliance, working with a coalition of governmental, academic, environmental, consumer, and private sector organizations, will develop the centers and will provide to them nationally coordinated management, information, and program support services.

Rationale. The successful resolution of environmental management or resource use issues requires an informed public. Education is required to develop this needed understanding. This educational process must include both "formal" programs planned for school children and "non-formal" programs directed to the public at large for it to be effective.

Environmental education programs, research, and information exist. Alliance affiliates and others offer a wide range of environmental education programs and materials. However, a central network to disseminate and develop environmental education resources does not exist. A national system that will coordinate the distribution of existing education resources and provide new resources where needed is essential to any serious strategy addressing the environmental concerns of our Nation.

The need for and importance of environmental education has received prominent recognition by a recent Presidential Commission on Americans and the outdoors. In 1986 this commission reported that an "outdoor ethic" is a priority issue of the American public; that people believe citizens should learn to appreciate the environment and respect it; and the residents of each community should decide how best to address these issues in their location. The Network is designed to foster such respect and to support local approaches to local environmental concerns.

Furthermore, in 1986 the United Nations called for partnerships between industry and environmental organizations to address pressing environmental issues. The Alliance, with its broad range of 34 affiliates representing conservation organizations, educators, corporations and organized labor, is such a partnership. Collectively more than 12 million members are represented by the Alliance affiliates.

Strategy. The Alliance will develop the Network by 1997. Its initial phase will be set up primarily in a 10-state area, comprising Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming. The Alliance will help cooperating organizations initiate programs and take advantage of the resources available from the Network.

The Network Management Committee, comprised of Alliance members and non-members and reporting to the Alliance Board of Directors, will direct the ongoing operations of the Network. Expansion of the Network will be determined on an annual basis.

A general implementation strategy is outlined below.

1. The Alliance will hold regional organizational meetings of prospective sponsors and concerned organizations. The purpose of these meetings will be to focus on local needs, programs, partnership building, and organizational concerns. The meetings also will help publicize the Network.

2. Centers will be established at key colleges or universities. Candidate schools must meet specific criteria (as yet to be determined by the Network Management Committee) and will be selected by the Alliance.

3. Locally each center will provide environmental programs and serve as a technical assistance, information, and training resource center for both schools and the public. Nationally each center will be a link in a nation wide information and education exchange among universities, private organizations, government agencies, and corporations.

4. A national electronic bulletin board will be established to link those involved in the Network, Alliance affiliates, and interested outside organizations. The bulletin board will carry short notices of timely program and partnership information that will be fed into the system directly by center staff. All information will be accessible by computers nation-wide.

5. The Alliance newsletter, Alliance Exchange, will carry articles of long-term interest; for example, reports of program successes and failures and reports on national sponsors and affiliate programs. The Exchange will be distributed to each center, to Alliance affiliates, and to other interested organizations.

6. The Alliance and the universities will match funds for operations, staff, and programs on an equal basis. In succeeding years universities will provide increasing proportions of their budgets; and within five years after initial funding, centers will operate independently of financial support from the Alliance. For continuous operation they will rely on various donations, contracts, and grants generated by the individual centers.

Tennessee River Valley Model. The Network approach to environmental education is modeled after an environmental/energy education network of university-based centers developed in the seven-state Tennessee River Valley region and sponsored by the Tennessee Valley Authority. The Tennessee Valley network offers teacher training, program development and dissemination, regional outreach services (such as technical assistance and workshops), and research opportunities. This network involves 13 universities and has trained 20,000 teachers during its 10 years of operation.

Goals & Objectives. The Network will better educate the public on environmental issues through programs for schools and for the general public. Programs will incorporate resources from the local and regional community as well as materials already available. Not only will these education efforts raise the level of public awareness and public discussion, the Network will strengthen community cooperation on local and regional environmental issues by opening channels of communication.

National Level. The Alliance will:

1. Establish at least five centers for environmental education each year.
   - a. A planning meeting was held in Omaha, Nebraska, April 1987, to contact prospective sites and introduce potential partners for centers in the 10-state area designated for phase one of the Network.
   - b. Select five universities to serve as regional centers for environmental education according to guidelines.
2. Market the Network concept nationally to prepare for expansion in subsequent years.
   - a. Four organizational meeting similar to the Omaha meeting were held to spur interest and begin the process of cooperation in other areas. Meetings were held in 1987 in San Francisco, New England region, Southeastern region, and the Great Lakes region.
   - b. Publicize the inauguration of the Network in three national educational journals and three national environmental journals.
   - c. Hold an annual national conference for the staff and partners of all centers.
3. Guarantee a wide distribution of environmental education materials available from national groups.

a. Provide each center with materials for their libraries from 25 environmental education publishers.

b. Distribute through the centers environmental education materials developed nationally by business, government, citizen organizations, and others to 2,000 teachers annually.

4. Serve as central coordinator for information exchange among centers and between centers and national organizations.

   a. Collect and share information on successful programs through a communication network that links the centers with each other and with the 34 affiliates of the Alliance, the more than 40 government agencies in the Federal Interagency Committee on Education/Subcommittee on Environmental Education, and others interested in environmental education.

      -The Alliance will establish a computerized information system accessible to affiliates, centers, and any interested party with a computer/modem and bulletin board access.

      -The Alliance will make available to the centers the extensive ERIC/SMEAC information clearinghouse on environmental education.

      -The Network also will be linked through the Alliance Exchange, the Alliance's national newsletter.

   b. Refer local networks, coalitions, and alliances to the centers and help coordinate activities as needed.

   c. Hold an annual conference of the Network for supporting partners and staff of all centers.

5. Evaluate the scope and content of each center within the Network.

    a. Center directors will submit to the national project director a quarterly written report, including a description of activities and the number of people reached.

    b. Informal telephone interviews with center directors will be conducted at least six times a year.

Local Centers for Environmental Education. Each center for environmental education will:

1. Provide information exchange, environmental program development and distribution, technical assistance, and training.

    a. Train 500 teachers each year to use environmental education programs and materials.

    b. Produce annually at least two new specialized educational programs that will focus on local environmental concerns or modify at least two existing programs to address local and regional environmental concerns.

2. Bring together those in their area who are concerned with environmental issues and coordinate cooperative programs.

    a. Conduct annually 10 cooperative programs, such as luncheon talks, workshops, lectures, and television interviews with citizen organizations.

    b. Hold annually 10 meetings with state resource and education agencies, local school administrators, business leaders, and government officials, as well as citizen groups both to provide programs and current information on environmental concerns and to invite their cooperation with projects of the center.

    c. Actively solicit the participation of at least two other college/university departments to cooperate on projects of the center. (Most environmental concerns have economic, biological, and social implications; thus, several different university departments will be able to contribute their expertise to a specific project.

3. Evaluate annually the effectiveness of the center's teacher training, two new educational programs, and 10 cooperative citizen programs.

    a. Document their effects on students and citizens by using pre- and posttests on attitudes and behaviors.

    b. Describe how they might be used by other groups in various regions of the country.

Background Information

History. The Alliance was established in 1973 and has contributed to the United States' policy on environmental education. Through sponsorship of five major national conferences, the Alliance has documented the needs and opportunities for environmental education and developed strategies on networking and information exchange. The membership of the Alliance represents the largest advocate for environmental education in North America, collectively totaling more than 12 million members of 34 affiliates. In 1986 the Alliance won the National Wildlife Federation's Conservation Achievement Award for Education for the United States, and just recently was presented Chevron's 1987 Conservation Award.

Philosophy. The Alliance believes that environmental education must be promoted to ensure that the American public is able to make informed judgments on environmental concerns, including resource management techniques, conservation, sustainable economic practices, development and protection of natural resources, energy use, and other environmental problems. The Alliance supports programming that is balanced and fair, and examines controversial issues from all sides. Advocacy groups, corporations, and government agencies benefit from an informed public, and education serves as a common ground for cooperation on environmental issues.

WILDLIFE '87: GAINING MOMENTUM

Joy Finlay, Chairman
Wildlife '87, National Committee
Edmonton, Alberta

Wildlife '87: Gaining Momentum is a nation wide effort, an example of environmental education in action--and an example of how there is no excuse that is good enough to prevent each of us from functioning as an environmental educator no matter what political, professional, or economic affiliation one may have!

Simply put, 1) Wildlife '87 is a year long centennial celebration of the first wildlife sanctuary in Canada, the first federally constituted wildlife sanctuary in the Western Hemisphere; 2) It is happening as a people driven concerted effort, and it is running on magic, not money!

The idea of having a centennial to celebrate 100 years since Sir John A. MacDonald set aside Last Mountain Lake in what is now Saskatchewan, was first generated within the Canadian Wildlife Service. By July 1985, with increasing government constraints, the idea was still getting nowhere.

I then presented a proposal to the board of the Canadian Nature Federation for a special centennial year of stepped-up effort and visibility for conservation efforts. They enthusiastically agreed to spearhead the plan. Immediately we proceeded to stimulate interest in every province, mainly by personal meetings and telephone contacts. We requested the Minister of Environment to officially declare the year for wildlife. We contacted the federal members of parliament across the country, again by personal contact, to support the minister in this "motherhood and apple pie" designation. The rationale was that it was high time for governments, organizations and individuals to begin cooperating positively on some common goals, rather than being divided and negative or reactive on their differences.

A National Committee was set up, with representatives from the "blue blood" national organizations. I was appointed Chairman. We set our goals:

-To work together, by networking, cooperating, and concerted effort on the centenary theme.

-To focus attention on wildlife and habitat, essentially raising awareness, the education component.

-To protect our wildlife heritage--the action, to make some concrete gains for wildlife such as setting aside land for habitat preservation.

We chose the theme WILDLIFE '87: GAINING MOMENTUM. We found that it couldn't be Wildlife Conservation or Wildlife Management without causing conflicting expectations. The theme had to be non threatening, just "Wildlife" alone. '87 left us open to interpretation as to which year, 1887, 1987, or 2087, representing a past, present and future framework.

GAINING MOMENTUM has been an excellent motto for the approach to honoring the good things of the past, while initiating new ventures for the present and instilling an expectation for future and ongoing achievements for wildlife and habitat enhancement.

The whooping crane was chosen for the logo, as it reflects a conservation story.

Regional interest was encouraged and provincial committees formed. Much time was spent on the telephone encouraging and arranging for a cooperative approach and united effort. Alberta was the first to incorporate, with 41 very diverse organizations represented. They raised funds and employed a full time coordinator. B.C. followed with a coordinator shortly after.

Nearly a year after our first approach, the federal Minister of the Environment declared 1987 to be the year for Wildlife '87. With the minister making the announcement, the theme now had legitimacy, and we felt we would soon be able to hire a national coordinator and have funds for operating. This dream never became a reality, and in a way it was probably a blessing in disguise. Otherwise we could never have proven that we could do a successful national program without any stable financing. In the end, Environment Canada has provided some contract funds to assist with some of the costs of operation. The Wildlife '87 National Committee office in Edmonton is in my residence. I was naive and never suspected as Chairman to also serve as everything else from executive director, editor of the national newsletter, chief file clerk and stamp licker. Like so many in Wildlife '87, my commitment was strong. I gave up a salaried position to volunteer full time for over two years.

The Kick-On to the year last December was an unqualified success. It complemented the Christmas Bird Counts. Tom McMillan, the Minister of Environment Canada, was part of it, as was artist Robert Bateman. We had national press, radio and television coverage.

To reinforce the theme of GAINING MOMENTUM, and to leave the year with a forward thrust, we will have a Kick-On to the second century of conservation (not a wind-up) event this December 26 and 27. We are having the first ever National Bird Watching Weekend, a family event. This year the theme will be "Experience the Birds of Christmas", and with volunteer help, we have a communications plan, a press kit, and a handbook for the nearly 200 coordinators across the country.

We are capitalizing on wildlife as a trend of the '80s. In 1982, Statistics Canada showed that 83.8% of Canadians participated in wildlife related activities, worth $4.2 billion dollars of which $3 billion was for nonconsumptive activities. A 1985 study by the US Fish and Wildlife Service showed 141 million Americans over the age of 16 participated in wildlife-associated recreation.

We have had some hype and some hoopla, or t-shirt and tinsel, but this birthday party has also had some presents too, presents for wildlife. Alberta has established the first eight Ecological Reserves and set aside another 17 Natural Areas. Up to 100 more are expected before the end of the year. Lands in other provinces have also been set aside as Wildlife '87 events. The first International Shore Bird reserve in Canada was established at Mary's Point in New Brunswick by the Canadian Wildlife Service. I know of other sites being set aside too in Newfoundland, Quebec and B.C. This gives positive press for elected officials.

Corporations have contributed to Wildlife '87. General Foods put the Wildlife '87 logo on their Post Cereal boxes with an art print offer, and pledged money to the World Wildlife Fund Canada for endangered species.

We have kept up a newsletter and we will review the year in our final issue; but we will never know the half of the impact this year's efforts have made.

If the three R's are basic to schooling, I think there are four R's basic to how we are approaching Wildlife '87: Reality, Relevance, Responsibility, and Relatedness. Even though Wildlife '87 was a dream, a vision, we began with hands on for what was REAL. We had to handle things in bite size pieces, and no bite was too small. We asked people personally to join in co-operating projects.

RELEVANCE is in timing; the time is right for a wildlife related theme.

We expected and facilitated RESPONSIBILITY, from politicians, civil servants, presidents of clubs and individuals, all to do their bit. "Treat people as if they were what they ought to be and you will help them to become what they are capable of being" (Ralph Waldo Emerson). We were also task and results oriented.

RELATEDNESS is the fact and process that we are all in it together, each a functioning part that determines the whole.

I have been asked for perceptions of what the keys to success have been and what we can learn from this effort. Here are some responses:

-Do more with less--we are in a new ear where funding can no longer be a prerequisite to getting things done.

-Choose a theme or vision that accentuates the positive. Use consultation and facilitation, not confrontation. The Alberta, B.C. and P.E.I. groups have demonstrated how well these approaches work, when politicians can gain praise for what they do instead of criticism for what they do not do. Help the elected officials do what is best, work with them, not against them.

-Have a common goal for concerted action. Everyone loves wildlife and it provides a theme for anyone to work toward. The reward is that individuals can feel part of a project that helps them feel they can make a difference. The theme is an entry point for participation.

- Be sensitive to timing; for there may be no such thing as a bad idea, only a wrong time for it. Wildlife ´87 capitalized on an event that happened 100 years ago, and everyone loves a birthday party.

- Use the celebration of past events to make long term gains for the future.

- Be prepared to give the project total commitment and leadership by example.

We are having a year long focus on wildlife, and action has become the norm. The momentum gained has already exceeded everyone´s wildest dreams, and just think what might happen if it can be further facilitated? Will organizations with built in membership networks carry the momentum? And if they do, we might even have built in continuity for advancing from this year´s efforts.

We took an historical event as cause to celebrate; chose a timely and popular theme; mixed enthusiasm with positive persistence; engaged the concerted support of national and regional organizations; offered the scheme as a political opportunity; encouraged corporate participation; included Prince Philip and invite the media to attend; and with a bit of luck and lots of hard work we have a model of shared membership, a model for a facilitative mode of operation. We are GAINING MOMENTUM to meet and prevent critical challenges ahead. We have the tools, how will we use them in this communication and computer age?

SPEECH GIVEN FOR THE NORTH AMERICAN ASSOCIATION FOR ENVIRONMENTAL EDUCATION

Clifford Lincoln
Minister of the Environment
Province of Quebec

Mister President,
Fellow Panelists,
Distinguished Guests,
Ladies and Gentlemen,

I believe that it is symbolic that we are meeting here in Quebec, the truly special city of convergence--even the name expresses it--the convergence of rivers and streams, the convergence of two great civilizations, the convergence of two great cultures, the convergence of the European ideas that founded Quebec and the new ways of modern-day North Americans.

Once there was a lake of Quebec here. One of those truly magnificent lakes which, if we live here in Quebec, we have seen hundreds of times; and if we don't live here, have admired on calendars and postcards; one of those lakes which make this country truly beautiful. At one time, there was such a lake here, a very typical lake, surrounded by trees, each one more majestic than the other, beech, birch and pine trees. There was a small bay in a corner of this lake where sea eagles made their home. And a small boy said to his father, "Dad, its a great place! Every day, I wake up to the call of the loon." Then man came. Man, with his bulldozer and his dynamite and, in the space of a few days, the centuries-old trees ceased to exist in that corner of the lake. Where once a magnificent forest thrived, there was not a single tree left standing. Today, on this land, there is just an open plain with two or three small trees. Where once a small colony of sea eagles nested, there is now a straight, sheet wall. The sea eagles do not live here anymore. Their natural habitat has been destroyed. The shade and the nesting sites they require are gone.

I did not invent this story, I lived it. This happened on my lake where I had a small chalet. It was my son, Larry, then a small boy, who told me, "Dad, its wonderful to wake up to the call of the loon." The loon isn't there anymore. This gives us cause to reflect....

Last year, I visited the Adirondacks with a friend and we stopped at one of those specialty shops typical of the area that you find traveling in America. It was a small shop, run by a man who loved nature and sold all kinds of books and objects on nature and ecology. I bought there a little wooden plaque on which were carved pictures of small animals, fish and birds endemic to the area. There was a message etched on the plaque which said, "We share with you the land, the sky, and the waters, but it is you who must decide whether we will always share it with you." This caused me to reflect about all living species, including the sea eagles on my lake, the small child who cannot speak, or the old man no longer able to express himself, or the handicapped who also cannot make his feelings known. We must consider the desires of all who cannot speak for themselves, and preserve for them the precious gift of nature that we all control. We must accept the fact that all living species have a voice in the preservation of our environment.

It is indeed because of them that we are here today, because we must all work towards the common goal. We must become sensitized and educated on the subject of the preservation of our natural environment.

I am of the Liberal tradition. I belong to the Liberal Party, but in a non-partisan way. I am, first of all, a plain Liberal. For me, Liberal thought centers itself, first and foremost, on the individual. It is the individual who is the basis for all society; it is the individual who counts first among all society. The right of the individual is the foundation of human society and, it seems to me today, that we have arrived at a turning point in history where; whatever we desire, whatever we do--right or wrong; society is demanding that the individual´s right to enjoy his environment must be protected. I hope that we will recognize together the right of the individual to enjoy his environment, and realize also his responsibility to preserve his environment.

If we demand, men and women alike, the right to a healthy environment, we must accept also the fact that we are all responsible for the environment of our neighbor. This is evident, and it is this that we must make our children understand. If we can help to enact these laws now through our work here today

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concerning living in harmony with our environment, our children will never need to refer to these laws in order to act to protect their environment because these laws will have become an integral part of their lives. They will understand and accept their responsibility for the protection and conservation of their natural environment.

We have here in Quebec a law concerning the quality of the environment that has brought international recognition. This law merits that recognition because it has a quality of life of which we are justly proud, and I think with reason. It confirms the right of humans and animals to live in a healthy environment. Our law gives all living species the right to a good quality of life. According to this law, the protection of the environment is essential to confirm this right. This law protects the safety of all living species. The structure of this law has given our citizens the legal and judicial right to accomplish this goal by making available the judicial mechanisms which permit a citizen to demand an ordinance of delay or an injunction in order to stop some process which would endanger his environment or the environment of others. We also have accorded to the individual the right to almost total information.

Some years ago, two years exactly, in December of 1985, the Prime Minister of Quebec, Mr. Robert Bourassa, in his inaugural address, confirmed this fundamental principle of the right to a quality life for the citizens of Quebec. I have advised the Environmental Protection Agency to begin work on this proclamation and they are doing this right now. Will there be a plan or perhaps a declaration? I do not think that the form of the document will be of great importance. But, what is important is to carry out the wishes of citizens in Quebec, all of Canada and everywhere to live a quality life.

In the international community, it is clear that the problem is very different since the rule of the sovereign governments will always prevail. But, at the same time, it must be pointed out that an immense step was made on the international scale during the first conference in Stockholm in 1972 where there was distrust on the part of the emerging nations toward the more developed countries, and this situation still exists today. In 1972, the less developed countries stated, "Pay attention! You are going to impose on us a declaration which is going to result in our not being able to develop at the same pace as you have done over the years." But then, the emerging nations gradually realized that the famous pace of development they coveted so much was not as advantageous as they had thought. All that was glittering before their eyes was not gold!

In effect, they quickly realized that the people enclosed in their hugh skyscrapers or their immense industrial complexes were no happier than others. The great factories and tall skyscrapers, the big profits in dollars or in yens, all of this did not speak of a better quality of life.

Because of the drastic evolution that we have experienced in the fifteen years between 1972 and 1987, the emerging nations and the developed nations began to realize that it was necessary for them to work together for their common good. Thus, the United States developed a universal strategy regarding conservation, and numerous international projects of concerted action were originated among others, such as the convention in Vienna, which was a forerunner of the recent Protocole de Montreal for the protection of the layer of ozone, the first international agreement on the environmental ratified not only by the developed nations but by the third world countries as well (24 countries have endorsed it to date).

This international movement is irreversible because, today, no matter whether a society is rich or poor, black or white, old or modern, no matter what the form of our society, the need for a good quality of life and a healthy environment is the most important goal, one based on the natural resources necessary for the preservation of the good of all life. That is why, as my colleague Jim Bradley has pointed out, the world Commission of the Environment and Development concluded the necessity of a universal declaration of the right of humanity to a healthy environment within the framework of continuing economic development.

But, at the same time, I hope that we will adopt the expression of good will that will compliment and reinforce the declaration of the rights of man in such an important area as the quality of life. In fact, it will be necessary for us to stress the following great principles: a) the recognition of the right of all human beings to a healthy environment; b) the obligation of all, individuals as well as nations, to work for the preservation of our ecosystems and our ecological processes which will allow all species to live; c) the adoption of adequate and minimal norms for these ecosystems; d) the continuous evaluation of all impacts on our environment; e) access for all citizens to reasonable and open information; f) advance warning between states, governments or individuals when an unexpected development might occur which could damage the environment of another as it was in the case of my lake; warning signals of expected happenings, and signals of accidents which may arise like Chernobyl so that emergency actions could be undertaken immediately to preserve all life forms.

Throughout the history of our society, we have upheld certain fundamental and judicial rights as well as the right of the individual to live a healthy life and receive an education, but, paradoxically, we have never thought to stress the right of the individual to have a quality of life and a safe environment which would permit him a better life, a better education and better working conditions. When we think of the people who live in Cubatao today, or in Mexico, where pollution reaches its highest levels, we think of how people could enjoy better conditions in which to work and learn in a cleaner environment. It seems to me that this is putting the cart before the horse.

We have to realize that, in our social, judicial and political system, we must stress the fundamental rights of the minorities, that we must stress the fundamental rights of the lower classes--and I am speaking here about the animals which are unable to talk; about the living species which also cannot talk; the children who are not able to defend themselves; I am talking here of those who are deaf, mute or handicapped. I have a handicapped son, and I know something about it. How do they express themselves in order to preserve their quality of life in the face of those who want to destroy it? If we take as a fundamental starting point that we must preserve minority rights, that we must protect the destitute of our society, isn't it more important to preserve these rights in reference to their quality of life? The quality of life is not only the right to go to school or to be healthy, but also the right to be able to breathe.

I have a book by Commander Cousteau about his exploration of the Amazon which I read and re-read because each time I find something new. He speaks of the Indians of the Amazon and about their almost 1000-year old culture, during which they learned to live with nature and to prepare natural remedies which they pass down from generation to generation. There is nothing written--it is like a "common law"--information is verbally communicated from generation to generation. Cousteau states that, because of the continuing destruction of the Amazonian forests and the ecological changes that are happening because of more and more invasion of the Amazon, he asks himself what may happen to the Indians of the Amazon. He wonders what will happen to those magnificent dolphins of the Amazon rivers. He poses the question, "When the legend of this enchanted land begins to disappear, what is going to happen to them?" He adds, "What will happen to them, the dolphins, the Indians of the Amazon, the magnificent trees? I think of them as a library which has been burned, and I ask myself how can we replace it?" How can we replace centuries-old books, those precious books that no longer exist today?

With this in mind, I would like to paraphrase from a Brazilian whose name is Aponildo Britto. He was one of the destroyers of the Amazon who converted himself and became an ardent ecologist, and he is now one of the greatest defenders of the Amazonian territory. He publishes a journal called Enfoque, which means Focus, and he entreats us, "We must find a slower, less brutal way of becoming civilized." These are the very words that are giving us something to think about because if we would have chosen a slower manner of living, a less brutal way to become civilized, perhaps we would not have created these industries which are polluting our river corridors and our rivers before knowing the consequences of this industrial growth. Maybe we should have paused to reflect before the production of, for example, aerosols and freons, which we thought to be great discoveries, in order to realize that, some years later, the layer of ozone would be penetrated and destroyed. If only we could have taken a little more time to become civilized.

I would like to leave you with a word of hope. I am not a pessimist, I am an optimist for nature. That we even meet here today proves it. I would like to recite for you a little poem by an author not known for his poetry. He has written a book about the environment which struck me and I covet this little excerpt:

if we let it
the earth can be born
again and again
facing the sun,
like those flowers
that close at night
yet open to the dawn.

I believe it is time to face the sun. Face the sun deliberately to open a bolder course for the future regarding the protection of the environment. I think the time has come to open to a new dawn, a dawn that will mean that all of us will have a right to a minimum standard of a quality of life, whatever the society we belong to, whether this society be rich or poor, black or white, ancient or modern, technologically proficient or not. That each one of us will have that right; especially those of us for whom we care the most, the people that have got less than ourselves, that can′t speak for themselves; the living species, insects and animals that are dependent on our actions--the flamingo in the Bahamas that Professor Reeves was talking about. That all of us start facing the sun because we have to open a new dawn of a quality of life for all of us, not just those of us living today, but for our children, and the children of our children.

Thank you.

INVITED PRESENTATIONS: SYMPOSIA, SEMINARS, PANEL DISCUSSIONS

SYMPOSIUM I

INTERNATIONAL ENVIRONMENTAL EDUCATION: A SUMMARY

Gary W. Mullins
The Ohio State University
Columbus, Ohio

Desh Bandhu
Indian Environmental Society
New Delhi, India

In the pristine historic environment of Quebec City, twenty presenters representing the breadth of international environmental education helped symposium participants gain a picture of environmental education worldwide. From Turkey to India to the Dominican Republic, the presenters shared common problems, unique solutions and challenged participants to look at the global issue of environmental education.

"While India recognized the need to integrate environmental considerations in development planning in the early seventies, it is only a decade later that a concerted effort at introducing environmental education in the (Indian) school system was made," stated Harjit Singh, Deputy Director for Environmental Education, Department of Environment (India). The keynote presenter shared how the basic education program envisioned by Mahatma Gandhi has evolved to include education about our environmental problems.

That program, the India National Environmental Campaign, which began in 1986, is targeting students, teachers, elected representatives, administration, journalists and professionals. With a theme of Conservation for Development the speaker shared his country's vision to truly promote environmental education. Behind this vision India is allocating a significant amount of funds and governmental support. In addition to using traditional channels, the campaign funds a variety of non-governmental organizations to reach these various target groups.

Kartikeya Sarabhai, Director, Centre for Environment Education (India) represents one such non-government organization which is working with the Indian government to promote environmental education. The development of interpretive signage and wayside exhibits for the National Zoological Park, New Delhi, the development of exhibits interpreting Kanha National Park, India's premier tiger reserve which holds Biosphere Reserve status, and the development of an integrated environmental education centre in Ahmedabad were examples shared. One special example was shared--while capitalizing on residents' fascination with snakes, the Centre managed to begin with a snake demonstration and build the program into an effective nature discovery centre (Sundarvan) with substantial visitation.

The sentiments of Indian environmental educators were best summed up in Singh's comments on the evolution of environmental education in India. "There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society beginning with the child. Environmental consciousness should include teaching in schools and colleges. This aspect will be integrated in the entire educational process."

Nicholas Polunin, an international leader in environmental education, began his "Around The World Talk" and world tour by stopping at the Symposium and delivering excerpts from his position paper entitled "Our World Menaced." Polunin began his treatise with a discussion of human overpopulation, which he sees as the primary cause of world environmental degradation, and carried the audience through twenty different impacts on environmental well being. He concluded with the challenge that of the twenty threats eighteen are human caused, thus we can do something about them.

Robert Roth, from The Ohio State University, represented the Dominican Republic by sharing how an effective education program dealing with agronomic practices is saving that country's last remaining topsoil in one region. Additionally the program has demonstrated to the rural hillside farmers that conservation has economic dividends. Using an adoption and diffusion model Roth explained how farmers in other areas are not petitioning for this same program. To encourage early participation in the initial training program, participants received baseball shirts. Early adopters who learned enough, and were willing and skilled enough to become teachers, were loaned a moped from the government. Incentives, good education techniques and worthwhile results are making this a model environmental management education program according to Roth.

From Turkey, Suleyman Ozoglu, consultant to the Environmental Problems Foundation of Turkey, shared Turkey's understanding of, and concern for, environmental problems. Turkey is on the threshold of environmental education. Ozoglu shared his idea of what is needed. In summing up the need Ozoglu stated "In order to maintain the quality of life and prevent environmental pollution, consideration of alternatives and compromise among competing aims must be a part of environmental education in the Turkish education system."

Rosanne Fortner, from The Ohio State University, is working with Korean teachers to integrate environmental education into their science education curriculum. During her program, she shared results of an innovative project in which the Korean Ministry of Education provides for 60 Korean teachers to study in the U.S. for a period of time. Later she and colleagues from Ohio State University's College of Education do follow-up workshops with those Koreans in their home country. Not only are there cognitive gains on both sides, but the cross cultural exchange is an added benefit according to Fortner.

Augusto Medina, World Wildlife Fund, and Christian Pleszczynska, Canadian International Development Agency, shared with the symposium participants how their two organizations are supporting environmental education worldwide. Both offered advice and examples of model programs. Their thesis is that networking is necessary and that funding is available to programs that are well conceived and show good promise for goal attainment.

Nancy Ratner, an environmental education consultant from Alaska, discussed how she is contributing to the international environmental education field by researching and developing a manual related to appropriate environmental media selection within the cross cultural context. Her examples of the interpretation of the same visuals from culture to culture were enlightening.

The report portion of the Symposium concluded with a round table discussion on "Plotting A Strategy For The Future: A Report On The Moscow Congress." Jerry Berberet chaired the panel of experts who reported on their observations of "Tbilisi Plus Ten" and then led the group in a discussion on the future of environmental education.

A panel discussion led by John Paulk, Tennessee Valley Authority, and Robert Roth, The Ohio State University, focused on NAEE´s role in international environmental education. Out of those discussions came a list of suggestions for NAEE´s international committee (chaired by Paulk) to consider. Among those topics to be considered are:

- -systems for improved sharing of techniques, materials and networking among international environmental educators.
- -expanded affiliate NAEE membership to attract international groups.
- -increased emphasis on funding for NAEE´s international efforts.
- -creation of a directory for international environmental educators and groups.
- -expanded international symposium.
- -a travel service and international homestay program.
- -listing of international opportunities.

Paulk´s committee will address these and other international topics.

The Symposium on International Environmental Education demonstrated an ability to draw a cross-section of NAEE members and to find common ground for discussion. Group discussion and questions from symposium participants indicated that NAEE´s members are globalists who gain from sharing ideas and who seek opportunities for cooperatively improving the global environment.

SYMPOSIUM II

ENVIRONMENTAL EDUCATION IN THE SCHOOL CURRICULUM: (HOW) DOES IT FIT?

Moderated by John F. Disinger
ERIC/SMEAC, The Ohio State University
Columbus, Ohio

Environmental education (i.e., the integrated study of topics related to the environment) has not been effectively institutionalized in elementary and secondary schools.

Apparent reasons for this situation are generally centered around the difficulty of "arranging for "curricular space" for interdisciplinary concerns. There are two distinct schools of thought as to its appropriate resolution: integrate environmental considerations into existing curricula as they may fit, or develop discrete programs of study which consider the environment, and its associated problems and issues, as a separate subject. There are, of course, many intermediate positions.

Several "expert papers" addressing possible resolutions of this concern were invited and presented, in symposium format. Symposium participants and members of the audience had opportunity to discuss presentations briefly.

The ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/SMEAC) is publishing the symposium papers, under the title "Trends and Issues in Environmental Education: EE in School Curricula," compiled and edited by John Disinger. An invited introduction was prepared by Paul F. Brandwein.

Brief summaries of the 14 papers, excerpted from Brandwein's introduction to the symposium report, are presented below. Complete texts of each are contained in the symposium report volume.

Chris Buethe, Indiana State University, Terre Haute, stresses that the "principal teachers of values should be the ones who are most concerned with environmental education." Thus, Buethe advocates "infusion by those who can, and most want to do the job." He suggests evaluating outcomes on the basis of individual and societal behaviors over a sufficient time period; then, if infusion is seen as failing, "a separate course for grade 8, simply called Earth."

Cheryl Charles, Director, Project WILD, insists that there is agreement that "environmental and conservation education is not a visible priority in public schools," and suggests that the power in determining what is actually to be taught lies with the individual classroom teacher, building principal, local school board, and parents. Thus, she makes a case for programs designed to stand alone, which can be "infused into existing curricula." She recognizes a number of limitations of this approach, but argues that it is both philosophically appropriate and realistic, providing evidence that these approaches work.

David C. Engleson, Wisconsin Department of Public Instruction, Madison, offers a personal concept of what environmental education should be, as expressed in Wisconsin's Guide to Curriculum Planning in Environmental Education, of which he was principal author. Wisconsin standards call for sequential plans in all curriculum areas, with the incorporation of environmental education objectives into all plans--and thus, total infusion.

William F. Hammond, Lee County Schools, Florida, takes an analytical view of insertion or infusion. In analyzing the two he finds benefits in both, but notes the possibility of hybridization. Hammond presents a set of "key operating concepts" that guide him in "considering the totality of relationships that define the system as an integrated whole;" his aim is "long-term sustenance" of a significant body of knowledge, attitudes, skills, and of a total view of the curriculum. His ideal is not only "a holistic program which infuses its instructional goals and objectives in every class, in every subject, every day," but also "a comprehensive program that consists of discrete courses" and in-depth units of study which become the responsibility of a variety of classes.[1]

Paul Hart, University of Regina, Saskatchewan, urges the need to develop a view why environmental education has followed its particular course of evolution. He argues that a significant paradigm shift is about to emerge, and posits that environmental educators cannot settle on either a single or a dual approach; the problems of the world are multifaceted, so educators must reflect this mode and "must continue a multifaceted approach to educational change." Hart concludes that "environmental education is an idea that is very close to achieving the critical mass to propel it into educational significance;" the goal is environmental literacy. He posits, as the critical problem, the need for education to direct its attention to education of teachers and the professional development of practicing teachers--all teachers.

Jerry Hodge, Boyne River Natural Science School, Ontario, insists that environmental education "should be consistent with the philosophical dimensions" of how the environment is understood by those in the field. He admires Project WILD and Project Learning Tree as examples of curricula that are balanced; he comes down hard on the side of integration, wholeness, and balance.

Harold R. Hungerford, Southern Illinois University, Carbondale, provides a carefully constructed comparison of two options: an investigative skills approach (developing in students the skills involved in the investigation and resolution of issues) and a case study approach (an issue case study of a single environmental issue, such as acid rain), as significant components of environmental education. He analyzes, then interprets, how these two methodologies can permeate the curriculum in infusion, insertion, integration. Thus, Hungerford sees problem-finding and problem-solving, "in-depth issue investigation," as central to environmental education. He wishes to change student behavior; thus, "we must attend to our goals initially and our curricular strategies secondarily."

Louis A. Iozzi, Rutgers University, New Jersey, summarizes an eclectic view; he considers that "whether environmental education is included in the curriculum as a separate subject, or if it is integrated and taught as part of another subject normally found in the schools...it (must) be taught in an interdisciplinary manner." Iozzi points up the critical lesson that the "body of literature sheds very little light on our symposium question," but notes that decisions on vital issues do not always depend on rigorous research. He insists that "environmental concepts appropriate to the discipline must be actually written into the curriculum to insure that over the course of the child's schooling, he or she receives a full environmental schooling."

Milton McClaren, Simon Fraser University, British Columbia, argues the advantages and disadvantages of both infused and mandated programs, noting that "either option has its strengths and its weaknesses." He posits that "successful curriculum implementation, whether of infused or mandated programs, depends on a social transaction with the teacher, a transaction in which the teacher is given an opportunity to participate, to become a co-developer as well as a user of the program." Thus, the teacher becomes a part of a team with a "sense of common, valuable purpose."

Ian Robottom, Deakin University, Victoria, Australia, states: "While I recognize the strong philosophical justification of environmental education as diffusion, I believe I have seen more 'successful' EE provision in the form of separate subjects. By 'success' here, I mean in terms of adherence to the critical, politicized prescriptions of EE emanating from the UNESCO EE program. When infusion is attempted, I have seen many instances of what I could call 'solicitous surrender.'" Thus, Robottom does not wish to abandon the "critical political edge" of environmental education whether or not the models are "infusion" or "insertion" of subject matter.

Peter A. Rubba Jr., The Pennsylvania State University, University Park, differentiates Science/Technology/Society and Environmental Education issues; he sees S/T/S issues as being of a more extended and covert nature. Rubba favors inclusion of societal issues of the EE flavor, investigative and action units, into the middle-junior and secondary science curriculum. He argues that it is conceivable that EE and S/T/S are in the position of subsuming each other, and points out that it doesn't really matter as long as it is done.

Rudolph J. H. Schafer, California Department of Education, Sacramento, follows another route; he suggests vectors (the "shaggy dogs of curriculum") that may be used to carry EE issues into the curriculum. His propositions lead to the inference that the understanding of bureaucracy and the policies and politics of curriculum in decision-making bodies are useful tools in advancing proposals and projects.

Bob Samples, an independent scholar, uses a different approach, pointing out that learning is a matter of the ecologies that are embraced in the brain-mind system. Because environmental education is devoted to both the cultural experience of mediated closed systems and open systems, he argues that it must be open to both. The dilemma? "On one hand, we honor the universe of mediated experience as organized by our cultural biases, and on the other we are exposed to the un-mediated dominion of natural systems where the mind must create reference;" thus, "the whole learner is not honored when either is ignored."

Kay Monroe Smith, Loyola University of Chicago, brings the propositions of educational research to the discussion, using Tyler´s four imperatives of curriculum development to analyze EE curricular thrusts. She notes that this approach is congruent with the definition of environmental education as education "about the environment, for the environment, in the environment." Smith´s paper can serve as a basis for valid consideration by curriculum specialists who are confronting the question, "Why, How, Where, When" environmental education?[2]

NOTES

1. Paper presented by Randolph Tully, Environmental Education Program, Lee County Schools.

2. Paper presented by Diane C. Cantrell, College of Education, The Ohio State University-Newark.

SEMINAR A

RELIGIOUS, ETHICAL AND PHILOSOPHICAL ISSUES IN ENVIRONMENTAL EDUCATION

Martin Ogle
Potomac Overlook Regional Park
Arlington, Virginia

Bruce Rinker
Millbrook School
Millbrook, NY

The rapid development of man's technologies during this century has resulted in many environmental and social problems. As this trend first became evident, many historians and philosophers attempted to explain the problems in religious, ethical, or philosophical (REP) terms. For instance, historian Lynn White argued in 1966 that "the roots of the present ecological crisis are religious in nature (ie. deeply grounded in Christian dogma) and a religious transformation rather than technological remedies would be required to solve it" (Leiss, 1972). Whether or not we agree completely with White, it would be shortsighted to rely only on more technology to correct our problems. An examination of REP issues is imperative if we are to make wise decisions about the way we treat our planet and each other.

The purpose of this seminar was to further recent interest among NAEE members in REP issues and to explore the practical applications of our discussions. The seminar was based around a panel of three persons who are intimately involved with both environmental and REP issues: 1) Dr. Douglas John Hall, Professor of Christian Theology at McGill University in Montreal; 2) Rev. William Gibson, Director of the Eco-Justice Project at Cornell University; and 3) Dr. Charles Yaple, Professor of Recreation and Leisure Studies, State University of New York at Cortland.

The seminar was divided into three sections: 1) responses by panelists to three predetermined questions; 2) questions and discussion between audience and panelists; and 3) listings of how issues discussed in sections 1 and 2 could practically be used in everyday environmental education. Following are condensations of each of the above sections.

Section 1--Panelist responses to three predetermined questions

Question 1: In his essay, "Loving Creation," Douglas John Hall sets forth three possible responses of mankind to our environment: 1) humanity above nature; 2) humanity with nature; and 3) humanity in nature. Which of these responses do you consider the most appropriate? Which response do you see our society involved in now? If the response you chose is different from what you see chosen by society, what do you consider the main cause for the difference?

Douglas John Hall (note: Dr. Hall is the author of the article from which question 1 is based): Dr. Hall sees the best response as humanity with nature. He noted that the concept of humanity above nature is the present course we are on and that this course is the cause of our present environmental problems. He also sees humanity in nature as an inappropriate response because: 1) this concept is "romantically naive" and not practical for society as a whole; and 2) human beings have capacities which do make us different from other forms of life and that to neglect these by immersing ourselves wholly in nature is wrong. In conclusion, Dr. Hall stated that "the only way to alter the...status quo, which is awful, is to try and show human beings that they are created for a special purpose within the natural world, as part of it, yet as having a special vocation within it."

William Gibson: Rev. Gibson believes that humanity with nature is the most appropriate response because it acknowledges the differences between human and non-human nature, yet at the same time recognizes a "solidarity" between them. Rev. Gibson sees our present economic system as the embodiment of man above nature and also as the major reason our society cannot seem to attain a more harmonious relationship with our Earth. The present system "ingeniously employs the human emotions of greed and envy as its motive power" (E.F. Schumacher) and is based on such short term considerations that it cannot address environmental and social problems. We are presently unable to break out of this system because we have become accustomed to the lifestyle it affords and we take it for granted.

Charles Yaple: Dr. Yaple considers humanity with nature the best response for three reasons: 1)

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it is the response suggested by the Biblical themes of unity between God, nature, and people (ie. Romans 8:18-23), and by the themes of God´s sovereignty over creation and mankind´s stewardship responsibilities; 2) we do not understand all about the environment and therefore cannot hope to be above it; and 3) humanity with nature is consistent with the thinking among many theologians that the cosmos is evolving (emerging) towards an ultimate state of harmony in a process that humans, creation and God are caught up in.

Question 2: It is generally accepted that for our lives to be interesting and fulfilling, there must be some element of challenge or "frontier." Various technologies that have been developed to fulfill these needs are often destructive to the environment. What challenges to the human mind are available which would allow us to live more harmoniously with our environment?

Douglas John Hall: Dr. Hall believes that the greatest challenge we face is peace with justice and a loving attitude towards Earth. Accordingly, he stated that we "need wisdom to direct our knowledge and...compassion to purify our wisdom." Unless we take this challenge of increasing our wisdom (ie. through the study of philosophy), our science and technology will remain, as Buber said, "leaderless." In comparison to wisdom, compassion, peace, justice and a loving attitude towards Earth, Dr. Hall noted that "the invention of more gadgets and chemical combinations is childish (not childlike).

William Gibson: Rev. Gibson observes that we live in a radically changing world which must eventually give up obsolete assumptions about our economy and lifestyles. He sees five great challenges which we must meet to affect the best transition into a new age: 1) the challenge of subordinating economics to ecology; 2) the challenge of equity within the human family; 3) the political challenge to democratically effect the preceding changes; 4) the lifestyle challenge of finding fulfillment in community rather than in unnecessary things; and 5) the challenge for technology to contribute to meeting the above challenges.

Charles Yaple: Three areas of great challenge can help us realize more harmonious relationships with our environment according to Dr. Yaple: 1) The inward challenge of studying self-awareness, metaphysics, and religion to work towards the spiritual/contemplative ideal of the ancient Greeks; 2) the outward challenge of space exploration to satisfy human beings' urge to explore; and 3) the Earthward challenge of determining how to provide a decent standard of living for all Earth's inhabitants.

Question 3: How is our value system affected by our relationship with our environment?

Douglas John Hall: "The wording of this question actually pinpoints the problem we are...trying to understand and cope with," according to Dr. Hall. That is, the problem of values. However, Dr. Hall is uneasy about the way we view values today. He refers to today's value system as "morality by consensus" because we tend only to consider something good when enough people think it is good. This ignores the inherent goodness in every part of creation which was recognized by the ancient founders of our civilization. When we do not acknowledge this inherent goodness, we view the world as a raw material with which we can create something that we consider good. Dr Hall does not foresee any great transformation in our values or the way we treat our planet unless we come to realize that our environment is valuable and good regardless of what we think about it.

William Gibson: Our value system today, according to Rev. Gibson, must be shaped by the unique environmental context in which we find ourselves: that is, an age where the scale and speed of environmental degradation is unprecedented and dangerous. Although greed and carelessness have victimized vulnerable people throughout history, today the Earth itself is being victimized. Therefore, Rev. Gibson outlines three classes of values which we need to develop: 1) values of sustainability--we must learn new lifestyles which the Earth can support over time; 2) values of sufficiency--we must commit ourselves to assuring the sustenance of the whole human family; and 3) values of solidarity--we must consider ourselves as one with the rest of humanity and nature in the struggle for justice. Rev. Gibson concluded by noting that "in our time, (justice) must be eco-justice--the well being of all humankind on a thriving Earth."

Charles Yaple: In addressing this question, Dr. Yaple noted that perhaps the opposite question might be more revealing: "how is our relationship with the environment affected by our value system?" His reasoning for this observation was that "environmental dilemmas are basically a spiritual problem" and that the solutions are probably religious, ethical and philosophical in nature. Dr. Yaple said that there are no easy answers to the original question and that more research is needed. The temptation to say that those closest to nature are the most respectful of it is contradicted by many facts. For instance, farmers pollute and many American Indians had wasteful practices, whereas many city dwellers are strong environmentalists.

Section 2--Questions and discussion

Nearly an hour of the seminar was devoted to questions and discussion between the audience and panel members. As many topics were considered and much was said, it would be impractical to record it all in this paper. Therefore, the questions which received the most attention are summarized here.

Q: The notion of community in traditional Christianity seems to have a strict human focus; ie., seems not to have a concern for the natural world. Now we are developing a different view of creation doctrine. How can these two opposing outlooks be reconciled?

A: The actual faith-practice of the early Christian communities was not necessarily reflecting the inherent meaning of Scripture. The Flood story is particularly illuminating. Here God makes a covenant with humanity and the Earth. Not acknowledging a relation of stewardship is a sign of unfaithfulness to that covenant.

Q: We have certain expressed needs; inward, outward, and Earthward. Signs of these needs include the many volumes on self-help and metaphysics, the desire to explore space, and our great awareness of hunger and poverty. How can "need" be defined appropriately?

A: Need is what is required for full human life including a nurtured spirit. What is right need and what is wrong need? Wrong need is that which disturbs the beauty and harmony of the biotic community. How easily our needs can be manipulated! The quest for wisdom is a deep part of us. Yet, our society represses this systematically. Look at our

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educational system which, of course, reflects the larger society. Does an eschatological view keep the faithful from procuring drastic change toward environmental goals? Remember that the Judaic traditions especially point toward the present life--not to something beyond.

Q: What are your reflections on the Deep Ecology Movement?

A: Inherent in the idea of moral relativism is an absence of a values hierarchy. Everyone has the right to his or her own ideas. However, we have a strong need to study the wisdom of the ancients. The "de-development of the ecological movement needs to be examined. It might lead us back to "man in nature" rather than to "man with nature"--which is the base of our covenant with God. The Deep Ecology Movement brings us closer to the "man in nature" idea.

Q: Is the development of an environmental ethic only an option for individuals? Isn´t it really a religious imposition?

A: Muir, Thoreau, and Emerson were very religious people; not churched people, but religious people. The fundamental traditions of our civilization are concerned with the inherent goodness in things--"fundamentum in rei." Respect for others and for other things is implicit in the goodness of created order. Therefore, it is not our own ideas which are imposed here, but those of Something beyond us. The locus of control is not derived from an individual, but from a covenanted relation with the Creator. An imposition? Yes. A sacrifice? No.

Section 3--Practical ways of considering REP issues in Environmental Education

It was noted during the discussion section that REP issues are not often raised in our present educational system. This may be partially due to the idea that these issues have no practical value and/or that they can only be discussed by trained philosophers and theologians. This section of the seminar was intended as a brainstorming session on how REP issues could be practically presented and used. (Author´s note: because time was lacking, the list of ideas was relatively short. If the reader has additional ideas, the authors would appreciate hearing about them). Following is the list generated at the conference.

1) Examine the intrinsic/spiritual values of wildlife/environment with the same emphasis presently given economic values. For example, as an exercize, list the values of a species of wildlife which has little or no economic value.

2) Use a "values continuum."

3) Examine our lifestyles and how they affect our environment and other people. Various games and activities are available for this purpose.

4) Be aware that our particular outlooks and morals are not the only ones nor necessarily the right ones. Use activities to gain perspectives of different cultures.

5) Be aware also, (in addition to #4, above), that judgments are perhaps inherent in teaching, ie., even if you try to present subjects in a way to let students make up their own minds, the materials you present and the focus you use are still subsets of the total picture.

6) Look at the Earth and our relationships to it from the point of view that the Earth is a living organism.

7) Do not discount feelings about things and issues even when they seem to counter scientific evidence.

8) Use the Socratic method.

9) Use established exercizes within existing curricula to explore REP issues. (ie. "Ethi-reasoning," an activity in Project WILD).

Conclusion

NAEE has a history of multi-level interest in REP issues in environmental education. As an organization, we have asked questions like: "How and why do we steward our fragile Earth?" and "Do the reasons for our stewardship extend beyond the question of physical survival?"

Several events led to the seminar summarized here. At the 1985 NAEE conference in Washington, D.C., theologian John Haupt presented a talk entitled "The Emergent Environment and the Problem of Cosmic Purpose." Building on the interest generated by this presentation, Dr. Charles Yaple arranged a meeting at the 1986 conference in Eugene, Oregon for NAEE members to discuss REP issues. From this meeting, an unofficial newsletter was developed and co-edited by the authors of this paper. This newsletter was sent to an original list of NAEE members at the 1986 meeting but is now sent to almost 40 subscribers including non-NAEE members.

It is hoped that this seminar exploring REP issues in environmental education will further the interest among NAEE members in these topics and prompt similar discussions, papers and seminars in the future.

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SEMINAR B

FOUR STEPS TO EVALUATING ENVIRONMENTAL EDUCATION LEARNING EXPERIENCES[1]

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What is evaluation and why bother with it?

Evaluation is something we do everyday--from looking in the mirror in the morning and judging our appearance to greeting a friend and eliciting a response about how he or she feels. We engage in it when we make most, if not all, our daily decisions, and in education, like so many professions, teachers make hundreds of decisions everyday.

Unfortunately, evaluation in education is all too often considered a tacked-on chore to satisfy some external entity that a program is worth the money. But after directing statewide curriculum development programs for fourteen years and being evaluated by outside evaluators as well as evaluating my own teaching and many other programs throughout the United States, I am convinced of the importance of and need for education evaluation. Moreover, if we want to find a niche for environmental education in the curriculum, we can't afford to not evaluate our programs. In fact, we must if we want to convince the educational community that we have something valuable to offer that will contribute to the improvement of education and make it more relevant to the future of our students.

How can we effectively evaluate our environmental education programs? In this brief paper, I shall set forth some basic steps and considerations which I believe will help environmental educators (and all educators for that matter) become better evaluators. In particular I stress the following:

-evaluation is a natural and integral part of good curriculum development and teaching

-curriculum developers, teachers, and students are important evaluators of educational programs

-evaluation is a way of improving how efficiently and effectively we plan, teach, and learn

-evaluation is easy if approached with an open mind and common sense.

If I were asked to define evaluation in one sentence, I would probably say that it is a systematic method of judging the worth or value of an educational program. But then I would hastily add to this somewhat pedantic language that it is a way of finding out answers to the following questions about a program:

1. What happened?
2. How did it happen?
3. Under what conditions did it happen?

The WHAT refers to the outcomes, the ends, or the products. The HOW is the process of planning, teaching, and learning--the methods and techniques used. CONDITIONS refers to the context of the program--the setting, facilities, equipment, other instructional resources, and kind of support.

Many, perhaps most, teachers think of evaluation in terms of deriving grades for student achievement. Its value as a tool for program improvement (the object of this paper) is all too often given little attention. Some obstacles are time, expense, fear of being evaluated, criticism of being too subjective, and complexity.

The perception that evaluation is complex, fraught with complicated mathematics, and difficult to understand can create an avoidance reaction. The purpose of this paper is to help simplify the process and take some of the mystery out of it. To do this, the process of evaluation is described as consisting of the following four steps:

1. Set expectations
2. Plan the evaluation
3. Determine results
4. Use the results

Step One: Set Expectations

Key questions for educators include the following: What do you want to happen as a result of the program? For example, what outcomes do you have in mind? In short, what are your objectives?

Expectations should start with a goal, such as the one proposed in the Belgrade Charter: A Global Framework for EE (Unesco, 1976). A goal is long range and direction-setting, but because it lacks detail for measurability, it is usually translated into more specific outcomes called objectives.

Objectives may be written at several levels. Behavioral objectives (also called performance or instructional objectives) emphasize quantitative and more objectively measured outcomes. These are precise statements of how students should behave or perform or what they should be able to do as a result of a program in order to demonstrate that they have acquired a learning--concept, attitude, or skill. The following is an example:

> Given the components of a food web, the learner will correctly draw connecting lines to the position held by a penguin.

Notice that evaluation is built in--the data to collect is identified.

Behavioral objectives can be written for: 1) knowledge and understanding, 2) thinking skills, 3) values and attitudes, and 4) action skills. Knowledge of something means knowing about it and being able to recall it from memory. Understanding something is at a higher cognitive level and means comprehending its meaning and being able to explain it.

According to the Tbilisi conference on environmental education, the problem-solving approach is probably the most distinguishing characteristic of environmental education. Such an approach requires the development of thinking skills. These include application, analysis, synthesis, and evaluation.

Without question the values we hold play a central role in problems of the environment. In fact, it may be said that issues are conflicts in values. Measuring attitudes and values is the most difficult task in evaluation because they cannot be measured directly.

Hungerford and Litherland identified six categories of environmental action: 1) persuasion, 2) consumerism, 3) political action, 4) legal action, 5) eco-management, and 6) interaction (Hungerford and Litherland, 1985).

Allowing for Unanticipated Outcomes. A major criticism of behavioral objectives is their tendency to focus the teacher on the achievement of predetermined outcomes to the extent that there is no exploration of what else the students may have learned. It is not unreasonable to expect that some of the most important results in student learning are unanticipated. Most will agree that it is impossible to anticipate all outcomes much less have the time to write objectives that cover all possibilities and test for them.

To allow for unanticipated outcomes, only a few objectives of highest priority should be written and evaluated. This will give room to search for other, sometimes more elusive and subtle but no less important, quantitative and qualitative changes in affective, cognitive, and action-skill development.

Intuitively Measured Outcomes. Another way to measure growth in student learning is to examine feelings and insights. Intuition is the sense of something not really evident. Is it important? There are those who will argue vigorously against the use of intuition in assessing program effectiveness. They say that it is not objective, that it's not based on "hard" data--information that is observable and measurable. But is all that we learn measurable? We all have feelings, and they often provide evidence that can't be ignored. There are those who maintain that intuition does have its place--that it is something that can be fruitfully examined.

Step Two: Plan the Evaluation

Key questions for educators include the following: How will you design your evaluation? When will you collect information? What information will you seek? What instruments will you use? How will you record your data?

Evaluation Design. The evaluation design establishes the overall organization and timing of the evaluation in order to detect real changes that can be attributed to your program. A great many designs are available to the teacher. A few of the more common ones are presented below:

Post-test design for summative evaluation: In this commonly used design, the teacher tests students at the completion of the program. This kind of test is known as a summative evaluation because it sums up what the student outcomes are at the end of the program.

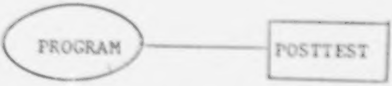

Figure 1

POST-TEST DESIGN FOR SUMMATIVE EVALUATION

Post-test design for formative and summative evaluation: In this design, the teacher checks student progress periodically during the program and makes any necessary adjustments in the program along the way. This design utilizes formative evaluation methods; that is, testing is done during the formative stages of the program and the students' development.

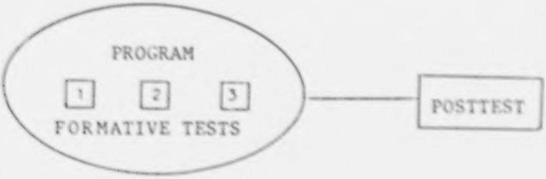

Figure 2

POST-TEST DESIGN FOR FORMATIVE AND SUMMATIVE EVALUATION

Pre-post-test design for formative and summative evaluation: A teacher sometimes gives a pre-test in order to find out where students are with respect to the program's objectives. This provides a benchmark for determining growth in learning when the results of the post-test are available.

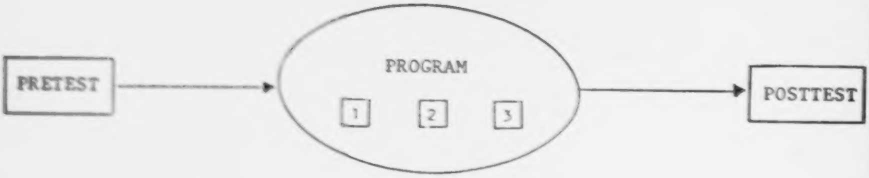

Figure 3

PRE-POST-TEST DESIGN FOR FORMATIVE AND SUMMATIVE EVALUATION

Pre-post-test design with program and no-program students: Other more complex designs involve comparing changes in students who participated in a program with changes in students not in the program. The design illustrated here allows the teacher to be more certain that the effects observed are a result of the program and not of something else.

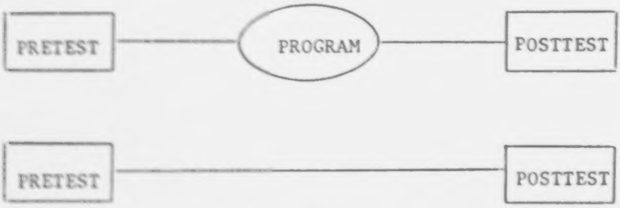

Figure 4

PRE-POST-TEST DESIGN WITH PROGRAM AND NO-PROGRAM GROUPS

Evaluation Instruments. A few general guidelines should be considered when developing or selecting evaluation instruments. First, the directions and questions should be clear. Second, the instruments should be easy to administer and score. Third, they should be valid and reliable. Validity simply means that a test measures what it is supposed to, such as a particular objective. Reliability refers to how consistently students respond to the questions. For example, clear, unambiguous questions should yield the same responses from students each time they encounter them if the students have the same level of knowledge.

A number of evaluation instruments are available for collecting information, including pencil and paper tests, performance tests of achievement, questionnaires, interview forms, observational instruments, artifact rating scales, unobtrusive measuring devices which do not intrude into the educational setting, and instruments to detect unanticipated outcomes, such as questionnaires and interview questions with open-ended items and action research approaches in which participants record and examine a program and its effects.

Step Three: Determine Results

Key questions this step addresses include the following: How should you conduct your evaluation? Does the information show that you accomplished your objectives? Where there any unanticipated outcomes? Did you intuitively perceive any outcomes not evident on paper? What problems and concerns arose?

Collecting Data. Before collecting data it is important to become familiar with the instruments, to have all materials available, and to check the setting so that distractions, clues, and other potential problems can be eliminated. During data collection, the evaluator should be alert to disruptions and the comfort of participants, remain neutral, give directions clearly, and keep track of time. After data collection, incidents that might have influenced the results should be noted and the data organized for analysis.

Summarizing Data. After data is collected, the next step is to summarize it in figures. One way is to find frequencies. A frequency is the number of times that something occurs in a given time or in a number of possibilities. Frequencies are often converted into percentages to provide a way of seeing more clearly the proportion of whatever is being measured to the whole.

Another common approach when faced with a range of scores, as one might be after tallying a test, is to find a middle value, often called a measure of central tendency. Three commonly used measures of central tendency are the arithmetic average or mean, the median or the midpoint between the two halves of a set of scores, and the mode or value occurring most often. Of these, the mean is generally preferred, however, when there are extreme scores, the median or mode is sometimes a better measure to use.

Measuring central tendency is not often sufficient to adequately describe a set of data. The amount of spread or variation in scores should also be considered. This is expressed as the range which is the high score minus the low score, the standard deviation which tells how widely the scores spread themselves around the mean, and variance which is the square of the standard deviation and is used in inferential statistics.

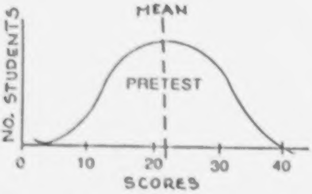

Figure 5
SPREAD OR VARIATION OF SCORES

Data can also be summarized graphically. Examples include bar graphs or histograms, frequency polygons, and pie graphs.

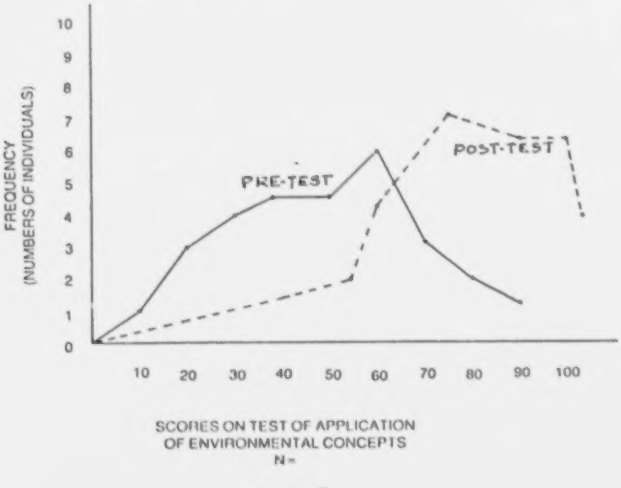

Figure 6
FREQUENCY POLYGON

Information can also be analyzed utilizing inferential statistics to determine the probability that any changes which occurred are real and not due to change errors and random fluctuations. The use of inferential statistics is often not within the experience of many teacher practitioners, but this should not necessarily preclude drawing valid conclusions from data. The use of descriptive statistics when combined with intuition and common sense can provide much direction for improving programs.

Analyzing and Interpreting Data. Once data is summarized, it needs to be analyzed in order to judge the extent objectives were achieved. When using test results as a means of improving a program, evaluators are generally interested in how the group as a whole does, for example, 70 percent of the students scored above 80 percent on a test. Comparing post-test results with those of a pre-test or the scores of other similar classes can help make evaluative judgments.

Before conclusions are drawn from data, one needs to be alert to possible sources of error. Some examples are inappropriate objectives, unreliable and invalid test questions, and the effects of outside influences.

Step Four: Use the Results

Key questions for educators include the following: Who should know the results? How will you report the results? What will you do to improve your program?

Reporting Results. Reporting the results of an evaluation is an essential step towards program improvement. Reports can inform others of a program's strengths and weaknesses, demonstrate a measure of accountability, generate confidence, garner support, organize information for program improvement, and provide feedback to participants.

There are many audiences for an evaluation report. They include: students, school administrative personnel, parents, interested citizens, other teachers, public agencies, and funding organizations. Special attention should be given to the rights of those evaluated when information is released.

In deciding what to say, each of the objectives and unanticipated outcomes should be addressed, including both positive and negatives aspects. The extent objectives were met should be reported in clear and honest terms, presenting and explaining all supporting evidence and how it was obtained. Aspects of the program that will need to be changed, dropped, or kept should be described. Final statements of summary, conclusion, and recommendation usually complete a report. A report is only as useful as it is understandable, therefore, its organization, content, and presentation should be relevant to the purposes of the report, clear and to the point, and not so general that crucial points are missed.

Improving the Program. Ultimately the purpose of evaluation is to improve the program so that it will in turn yield greater returns regarding student learning and its impact on society and the environment. A first step is to examine recommendations in light of a program's rationale, goals, and objectives. Changes at these fundamental levels should be implemented first. all other improvements will necessarily relate to these.

Other major considerations for program improvement include the following: setting priorities, establishing time-lines or schedules for implementing changes, and identifying major opportunities and constraints related to such factors as time, money, human resources, information, and materials and equipment.

NOTES

[1] A more detailed elaboration of this subject can be found in the author's book, Evaluating Environmental Education in Schools: A Practical Guide for Teachers, published in Paris, France, by the Unesco-UNEP International Environmental Education Programme, Division of Science, Technical, and Environmental Education, 1984. The book is available in microfiche through ERIC Document Reproduction Service, 3900 Wheeler Avenue, Alexandria, VA 22304-5110.

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SEMINAR C

ENVIRONMENTAL ACTIVISM REVISITED

Moderated by Larissa A. Grunig
University of Maryland
College Park, Maryland

Overview

The environmental movement of the 1960s and early 1970s resulted in unprecedented attention to environmental issues both in the mass media and in the scholarly literature. Interest has waned in recent years, with a concomitant erosion of coverage of what many consider enduring problems--particularly in water and air pollution and nuclear power.

This panel brings together both an historical perspective and a current picture of one critical element in the environmental-movement dynamic: the clash between environmental activists and their target organizations. Papers summarized here focus on the communication involved--whether that communication involves the pressure groups themselves, the media that cover them, governmental agencies with the power to regulate their opponents or the public relations practitioners employed by the organizations they oppose.

As a result, participants in this three-hour session could come away with a glimpse into the future of environmental activism--with implications for managing communication among the key plays identified as activists, organizations, the government and mass media.

Media and Protest

George A. Donohue
Phillip J. Tichenor
Clarice N. Olien
University of Minnesota

Media traditionally have been seen as vital resources for social protest. Groups concerned about environmental degradation regularly look to media to transmit their views to the larger society. An historically held belief is that media are not only available to social protest but are obliged to report grievances as well as any conditions of the environment which the public need to know.

A social obligation to report social disparities is at the heart of the belief that the media have a "Fourth Estate," or watchdog role in society. In this conception, the press is a necessary channel, independent from the other Estates and a safety valve for social strains. By reporting dissension, the Fourth Estate provides an alternative source of information.

Extensive review of the literature shows, however, that the media do not perform this "watchdog" function as much as conventional wisdom suggests. The media are organized agencies that respond to centers of power in other institutional areas--especially government and business. In fact, potential subservience of American media to economic interests was a central theme in the 1947 Hutchins Commission's critique of the press. More recent academic studies have supported the report's basic premise of economic control. Others have elaborated the role of the press in supporting community power centers.

Nevertheless, newspapers, magazines, radio and television do play crucial roles in social protest movements. A Fourth Estate perspective might imply that movements center on media, or that media create social movements. Instead, social movements begin with small but highly involved sets of concerned people often working behind the scenes for long periods of time before "going public" with their appeals. Legitimation is often a precondition of media coverage.

The environmental movement typifies the role of the mass media as a Fourth estate for powerless groups, but as an integral part of the process of accommodation of social protest. Literature shows that coverage by the mass media is part of a process of acceleration rather than initiation of movements.

Evidence from a series of studies in Minnesota, summarized in this paper, supports the conclusion that the press is primarily supportive of legitimized authority that seeks to accommodate social protest rather than modify existing relationships in social power. These studies have involved analyses of media content, interviews with media leaders and surveys among media audiences during such intense confrontations as occurred in the planning and building of a high-voltage powerline in the late 1970s.

Findings show that on the whole, newspapers in the more pluralistic community structures are more likely to report conflict and that the leadership there recognizes that role. Established leaders--such as elected and appointed officials, business leaders and leaders of farm groups--appear less likely than citizen group leaders, individuals or student group leaders to regard the media as explicitly positive or negative.

Finally, while media in a protest were found to serve largely to reinforce existing power relationships, they are integral to the process--performing both accelerating and decelerating functions. In the beginning, they are accelerators, in that providing coverage of countervailing views gives attention to them and thus gives them a measure of legitimacy as an item for priority attention. Over time, though, the media may refer to the protestors with major delegitimizing references, such as calling the breaking of power line insulators "vandalism."

The media, then, clearly are information resources for social protest. In becoming part of the social controversy, though, the media respond as agents of legitimacy within the system rather than as independent fourth estate watchdogs.

Newspaper Coverage of a Nuclear Waste Siting Process

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This structural analysis of community newspapers examines the relationships between their coverage of conflict and the type of community to be affected by nuclear waste siting. It begins with the question of what news comes to be, what journalists choose to report.

Key factors influencing coverage include 1) individual preferences of reporters; 2) constraints of the news business, such as deadlines and technology; and 3) structures, or patterns, of coverage. This last factor or level of analysis is the focus of this study. It marks an important departure from earlier approaches that centered only on the first two factors listed above.

This ideal opportunity to answer the question of what news comes to be occurred with a decision of the Department of Energy in January of 1986. The DOE determined that Wisconsin would be a secondary site for nuclear waste repositories. The study, then, looked at the ways in which the media in 33 affected communities coped with this hot issue. In particular, it examined the types of coverage given the issue during the five months between January and May, when the federal government ended up "backpedalling" on its decision.

The primary research question is: "Does what is known about the different communities help predict patterns of coverage of the conflict there?" Communities were considered to be more or less pluralistic or homogeneous and consensual.

The 33 communities were ranked in terms of their degree of pluralism. Then, a purposive sample of 12 newspapers was selected for content analysis. In addition, editors were interviewed in depth to gauge the extent of institutional constraints they experienced. Finally, reporters were interviewed in depth to assess their individual perceptions of the importance of the issue at hand.

Findings showed that the more pluralistic the community, the more likely its local media were to report conflict. ("Reporting conflict" was defined as articles that presented two sides of the issue.) Also, the more pluralistic the community, the more enterprise reporting that took place. In other words, reporters there "hustled" for stories rather than simply reacted to events or covered what happened. Finally, the attitudes of individual editors and reporters accounted for the most enterprise reporting--although little evidence of any enterprise reporting was found.

A Situational Theory of Environmental Issues, Publics and Activists

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Public opinion about the environment waxes and wanes as issues, personalities and conflicts change. There is no such thing, however, as a single public opinion. Rather, there are opinions of publics, each created by issues. What waxes and wanes is the number and level of activity of the publics.

Publics arising around environmental issues present opportunities for activist groups and threats for organizations that have adverse effects on the environment. Both must communicate with environmental publics: activist groups to mobilize support and offending organizations to resolve conflicts that threaten their autonomy.

This paper reviews the results of a program of research to develop a theory of publics. The theory segments the "general public" into categories useful for planning communication programs. Its basic dependent variables, active and passive communication behavior, can be regarded as information seeking and processing. Recent research has added cognitive, attitudinal and behavioral effects as dependent variables.

The theory's independent variables are situational in the sense that they describe the perceptions people have of specific situations, especially situations that produce issues. This situational definition provides a logical connection between these concepts and the idea that issues create publics. These variables are:

-Problem recognition. People detect that something should be done about a situation and stop to think about what to do.

-Constraint recognition. People perceive that there are obstacles that limit their ability to do anything about the situation.

-Level of involvement. The extent to which people connect themselves with the situation.

Research has confirmed that high problem recognition and low constraint recognition increase information seeking and processing. Level of involvement increases information seeking but has little effect on processing.

People communicating actively develop more organized cognitions, are more likely to have attitudes about a situation, and more often engage in behavior to do something about the situation. However, cognitive effects occur more often than attitudinal effects. Similarly, the theory predicts whether people will have an attitude or engage in a behavior but not what that attitude or behavior will be.

In a typical study using this theory, the author begins by identifying related situations that could bring about a public. Then survey questions measure each of the variables for each issue. Canonical correlation identifies a pattern of situational perceptions and communication behaviors and effects, patterns then used to define publics.

Canonical variates produced by this program of research consistently have defined four kinds of publics:

- All-issue publics, active on all issues studied.
- Apathetic publics that communicate little about any of the issues.
- Single-issue publics, active on one issue.
- Involving-issue-only publics, active on a "hot issue"

that involve nearly everyone and that receive extensive media coverage.

Other studies have looked for the kinds of attitudes held by these different publics and have tried to explain how cognitions and attitudes vary with situations. In environmental studies, the most common variables used have been the orientations toward scarcity identified by Stamm and Bowes in 1972: "reversal of the trend" toward scarcity and using a "functional substitute."

The studies summarized here showed that environmental publics typically apply the reversal of trends. When they must give up something personally in an environmental situation, however, they are more willing to find a substitute. Active publics also tend to hold anti-business cognitions and attitudes; they support governmental solutions to environmental issues.

Members of active environmental publics seem likely to become members of activist groups. The question that remains is why so many people appear concerned about environmental issues yet do little about them. The answer may lie in a new concept of the theory: a distinction between internal and external components of the its independent variables. Internal problems reflect curiosity or intellectual interests. External problems are problems with which an individual has to deal. Internal situational concepts seem to explain publics concerned about the environment but inactive in doing something about it. External concepts explain more active publics. This distinction offers a major advance in understanding the opinions of publics.

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Activism in the Northwest: Surveying the Effects of Public Relations on Conflict Resolution

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Environmentalism threatens to erupt once again into the consciousness of this nation. Public relations practitioners are the spokespeople chosen most frequently to contend with the demands of activists who oppose their organizations on a number of critical fronts: acid rain, timber resources, groundwater pollution and nuclear energy. Implications of the survey data presented in this paper should help them deal more effectively with the myriad special interest groups challenging them directly and indirectly, through both the mass media and government. The study also serves as a benchmark in helping chart the course of activism and organization response.

A telephone survey of public relations practitioners throughout the Pacific Northwest resulted in nearly 200 responses from governmental agencies, corporations and associations. Following the data that described this stratified random sample, correlational analysis and discriminant analysis identified variables associated with success of the typical activist group or success of the target organization.

About half of all respondents indicated that they had experienced the pressure of environmental activism recently. Governmental offices were the most frequent target of activism. These interactions between public agencies and activist groups tended to be the least successful for the organization.

Across organizations, though, pressure groups prevail more often than they lose in environmental disputes. Further, environmentalism dominates as the concern of activists in general.

Activists' tactics ranged from the innocuousness of direct mail campaigns to the violence of dynamiting power lines. Mild forms of protest predominate. However, the most visible tactics are more effective than the sub rosa approach inherent in telephoning or circulating petitions.

Organizations adopt a variety of approaches to countering this external opposition. The most effective response is a responsible one that may include incorporating environmentalists in the organization's planning process or placing one of their leaders on the board of directors. Research on the pressure group and budgeting for public relations both increase the organization's chances of success in coping with activism. Surprisingly, professionalism of the public relations practitioners decreases the likelihood that the organization will prevail. Longevity of the practitioner in the organization, though, is a significant predictor of organizational success in dealing with environmentalists.

Although most respondents believed the mass media had treated the conflict fairly, almost half would have preferred less coverage. Media attention to the dispute between organizations and activists

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helps create the community knowledge of an environmental dispute that often leads organizations to respond more quickly and more openly than they would in obscurity. Thus they are almost forced to act responsibly. Only rarely, though, does the organization change its policies or even develop new programs in response to environmental activism.

Today's College Youth--A Generation at Rest?

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One important goal of environmental educators is to produce a citizenry that is knowledgeable concerning the environment, aware and skilled in how to become involved in helping solve its associated problems and motivated to work toward their solution. One theoretical model proposed to account for variability in response to environmental education suggested it is the socialization process by which an individual acquires environmental attitudes, values and interest; knowledge of environmental problems; motivation to participate in environmental issues; and a psychological identification with environmental activists.

A key assumption of this socialization perspective is that to understand behavior, researchers must specify social origins of that behavior and the processes by which it is learned and maintained. In this model of the socialization process of environmental activists, influence variables have been identified as:

-System relevance. The body of shared knowledge and environmental values, attitudes and behavior that maintain environmental activists as a social movement.

-Content. Information that is transmitted to new members of the environmental movement, resulting in persistence of that movement.

-Maturation. The development of environmental socialization across the life cycle.

-Generation. Variation that results from differences in experience of people who are born at different times.

-Action-Reaction Style, Cross-Cultural Variation. Variation in the socialization process across governmental systems.

-Action-Reaction Style, Sub-Cultural and Group Variation. Differences in environmental activism within cultures and between groups due to factors such as sex, SES, religious preferences and regional and geographic variation.

-The learning process. Self-adaptive activities of individuals--how they attempt to make sense of an environmental system that they have had no part in creating.

-The agencies. The roles different agencies have in teaching in the socialization process.

-Interaction. Social contact among individuals as well as their use of the mass media.

-Feedback. Individuals' awareness of the efficacy and consequences of action as well as responses from other people regarding that action.

-Environment. Geographic or spatial reference, physical data and individual perceptions of one's surroundings.

Thirteen years ago, this author developed a questionnaire to investigate the range of pro-environmental behavior in the general population. At that time, at least one-third of the political activism reported in his statewide random sample of adults in Wisconsin was pro-environmental.

To analyze the development of environmental activism across the life cycle, a recent investigation determined the commitment to pro-environmental behavior by today's college students. A random sample of 282 Humboldt State University students was surveyed by telephone. Interviewers asked the respondents demographic and lifestyle questions as well as the activism items dictated by the influence variables list above.

Results showed a higher level of pro-environmental behavior in all environmental-activism items than the sample of adults in 1974. At least half the political activism reported involved environmentalism. College students also were more active than the adults in all but one general political activism item.

From a socialization perspective, results suggest these college students are very politically active--not a generation at rest. Given the students' average age, 26, results also suggest that environmental activism develops relatively early in the life cycle. Of course this university in California may attract a particularly activist-oriented student body. Therefore, this study should be replicated with current statewide random samples of adults and with other university students.

Applications of Cognitive Psychology to Environmental Communication: Toward a Cognitive Psychology of Journalism

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This paper begins by contrasting B. F. Skinner's radical behaviorism, inveighing against the existence of the human mind, with the contemporary cognitive revolution in psychology. Researchers in mass communication recently have applied cognitive models to the study of media effects with great success.

The impetus for this paper comes from the growing cognitive literature documenting errors and biases in human thought. More precisely, it comes from research on the "confirmation bias," a tendency to posit hypotheses about the world and to test these hypotheses using strategies that confirm rather than disconfirm them.

Not only is there anecdotal evidence to suggest that journalists entertain such hypotheses, but there also is anecdotal data to suggest that they may collect and evaluate information in a confirmatory way. This can be a problem, especially if journalists fail to do one or more of the following: consider alternative hypotheses, find sources who might disconfirm their hypotheses, ask questions that might elicit disconfirming evidence or accept disconfirming evidence when available. When this happens, readers may be led to erroneous conclusions about important environmental issues.

Using coverage of the Chernobyl accident as an example, this paper reviews such "errors" in journalistic judgement. Given what cognitive psychologists have said about the ways in which people fail to test their hypotheses, the study speculates that American journalists--though bound by traditional expectations for "neutral inquiry"--unwittingly may have used strategies that made their inquiry anything but neutral. They may have failed to entertain alternative hypotheses--that a paucity of information following a disaster of this magnitude is common across societies, for example. They may have sought a disproportionate number of sources--such as American officials, nuclear-industry representatives and ham radio operators in Eastern Europe--who confirmed their hypotheses. They may have preferentially asked questions of these sources that confirmed their preconceived notions (for example, how out-moded IS Soviet technology?) Finally, they may have readily accepted evidence that confirmed their views (as was the case with casualty figures) and discounted evidence that did not.

A Past Presidents' Panel: EE and NAEE--Past, Present, Future

Moderated by
John F. Disinger
NAEE Immediate Past President
The Ohio State University
Columbus, Ohio

A panel of past presidents of the North American Association for Environmental Education was convened, as an open session at the Association's 1987 conference, to discuss the present status of, and apparent prospects for, both environmental education as a field and NAEE as an organization. Each participating past president prepared and presented a set of comments, including recommendations which are being sent to the Association's Board of Directors, as a report of the Council of Past Presidents. Their presentations, summarized below, served as a springboard for discussion between and among panelists and members of the audience.

Robert E. Roth, The Ohio State University (NAEE President, 1976-77

NAEE was founded in 1971 by a group of community college personnel who were involved with the "Man and Environment" course developed through Miami-Dade Community College. Since 1973, there has been a significant decline in junior college and community college involvement in the Association, though that group started the organization. Concurrently, many of the Association's early efforts at broad-based involvement have become relatively dormant. It is proposed that:

-The organization's membership base be expanded to include greater representation from junior and community colleges, by re-inviting junior and community college presidents to participate;

-Media representatives--journalists, etc--identified with environmental reporting be invited to participate;

-Outreach to corporate entities be developed;

-An international networking system be fostered;

-More rigorous and generalizable research in the field be encouraged; and

-An EcoNet Directory and an International Environmental Education Program Directory be produced.

Judith M. Schultz, University of Cincinnati (NAEE President 1982-83)

What is NAEE, where has it come, and where is it going? Or, more importantly, what does its membership want from its professional organization? What, even locally, can or should a professional association offer to its members, who in this case are attempting to develop and maintain themselves as professional environmental educators? Various scenarios come to mind. Should NAEE be primarily, perhaps only, a vehicle for sharing new ideas and approaches, and for meeting others in the field through its annual conferences--workshops, film and computer festivals, etc.? Do members need or wish to have a political representative for their career field visible at state, provincial, and national levels, as does (for example) the National Science Teachers Association? Under current U.S. tax regulations, a percentage of the Association's funds is allowable for this purpose. Should NAEE aggressively embark upon, or subcontract for, projects in such areas as energy and/or hazardous waste education? This is another consideration.

During my tenure as president, NAEE formalized its philosophy and Mission Statement. Also at that time, it successfully took a stand, for the first time, in supporting EE teacher certification in the State of Wisconsin, where such a program has since been enacted. Additionally, the Association also made a commitment to extend its sphere of influence outside of the continental United States to North America. Now, it must decide whether it wishes to extend its political involvement, increase its geographical representation, and increase its service orientation.

NAEE may decide simply to accept the status quo and maintain its role of sponsoring annual conferences, and little else. Even so, it must face the question of what size it wishes its membership to become. For instance, do we want a huge meeting attendance that can only be accommodated by major urban hotels? If we continue to deal with large hotels, we need a clear cut strategy for working with them. Quality of presentations and publications must also be a goal. Many of these need substantial improvement, while others are already excellent.

Preservation of status quo has not always been NAEE's priority, as I have indicated. I believe that the Association has reached a major crossroads. Crises are really opportunities; difficult though they may be, they give us a chance to debate and explore options. Someone recently made the observation that nearly all NAEE Board deliberations are unanimous in current meetings. Where is the healthy debate and controversy that will chart our direction for the future? I would challenge the Board of Directors to set aside adequate time alone and with members, and to provide opportunity through *The Communicator* to debate its priorities. The number of Association members who have attended this Past Presidents' Panel and have expressed concern for and interest in the future need to be heard by the Board; they are the lifeblood of the organization. Let's work together now to forge our future.

William B. Stapp, The University of Michigan (NAEE President, 1983-84

I would like to direct my thoughts to the international dimension of the North American Association for Environmental Education.

NAEE is pursuing a delicate policy of becoming more international as we changed from the National Association for Environmental Education to the North American Association for Environmental Education. I think that this transition has occurred in a positive way, and in a manner that has started to bring environmental educators from Canada and the United States closer together. Initial steps have been taken to start organizational involvement with Mexico. We now need to collaborate on some joint environmental education projects. We have a great deal more work to perform to achieve our vision.

NAEE has taken the initial step to focus on ways of becoming more international by forming a Standing Committee on International Relations. This committee realizes that we are at the initial stage of furthering our working relationship between the United States and Canada, and the development of a potential working relationship with Mexico. This offers an excellent opportunity to focus on environmental education issues that are critical to Mexico and to both Canada and the United States.

This relationship also presents some special problems, such as language differences, geographical separation, meeting both national and international environmental education needs, developing collaborative efforts, a body that can represent North American interests in environmental education policy, and serve effectively both national and transnational membership needs. These issues are not too different than those that relate to other institutions that have formed to recognize the importance of benefiting from an international orientation, such as the Nordic Environmental Education Council, the Arab League Educational, Scientific, and Cultural Organization, the European Community Environmental Education Network, the Eastern European Environmental Education Association, the Science Education Program for Africa, and the African Social Studies Association.

If NAEE is to achieve its potential as a truly North American organization, then we might consider action steps such as:

-Development of NAEE programs, activities, and services of value to Canadian and U.S. environmental educators;

-Development of an action plan, describing specific programs and services to be developed in cooperation with Mexican environmental educators and addressing how language differences will be resolved, for active participation by Mexico in NAEE affairs;

-Investigation of "Tbilisi + 10" recommendations and determination of what NAEE´s response should be to most effectively promote international environmental education; and

-Development of NAEE infrastructure and external support (organizational, information and communication, resource materials, professional benefits, project development, financial resources, etc.) to further our international efforts.

If NAEE is to achieve its potential as a truly North American organization, then we must direct our energies to the potential action steps outlined by our Committee on International Relations.

John F. Disinger, The Ohio State University (NAEE President 1985-86

NAEE has an admirable track record of progressively valuable annual conferences. In addition to both quality and diversity of conference programming, no apologies need be made for site selection, conference organization, and so on. Similarly, the Association has progressed admirably in terms of utilization of its Headquarters, and in development of workable governance documents--Constitution, By-laws, Standard Operating Procedures, and Headquarters Agreement. Of course, these are merely procedural--they don't accomplish anything in themselves, but they can (and should, and so far, actually do) facilitate Association programming and identification and provision of services.

In addition to its efforts at developing and streamlining organizational infrastructure and moving effectively toward internationalization, NAEE has during the past several years expended a great deal of energy, and made rather remarkable progress, toward development of its present sectional structure. These sections, at least theoretically, provide a nurturing home for any individual or group of individuals having professional interest in environmental education.

However, what is apparent and simple in theory frequently becomes obtuse and complex in practice. In organizing itself into sections, the Association has found itself confronted with somewhat different sets of professional needs and expectations, and markedly different operating styles. Without belaboring the point, and also running the risk of over-generalization, the immediate educational needs and expectations of the tertiary level environmental scientist, the K-12 teacher, administrator, supervisor, curriculum specialist, or teacher educator, and the non-formal environmental education/interpretation/communication specialist are very different, and are perceived by each group as being different, in all directions and from all sides. Thus, the question of how the organization provides services, and the identification of needed services, to its diverse constituencies cannot be treated lightly. Determining the appropriate balance among the needs and interests of sections, and finding ways to maintain it, will challenge NAEE as long as it exists in its present form. But any changes in the Association's structure or operating procedures which favor the interests and needs of any one section at the expense of the others will be ultimately self-defeating.

Perhaps the member service area needing development most urgently is publications. NAEE has been blessed for some years by the effectiveness of those individuals who have been involved in the publications area. This is most notably evidenced by the editors of The Communicator, who have--quite literally, single-handedly--produced a much better newsletter than the Association has deserved, if the documented evidence of minimal budgetary allocations and embarrassingly insignificant other support is considered. Similar comments might be made about NAEE's now-defunct Current Issues series, and its now-operative Monograph series--those involved have performed admirably, but largely at their own expense of time and effort.

It is time for the Association to take its publications program much more seriously--timeliness, balance, depth, and so on. The problem is partly budgetary, but it is largely definitional--what publications do our members want and need, how can they be developed and provided? An organization which does not provide significant professional services for its clientele beyond an annual conference, as excellent as that may be, is missing both opportunity and obligation. NAEE needs to decide what is publications program should be, then take steps to implement its vision.

William G. Berberet, Willamette University (Incumbent NAEE President, 1986-87

The thoughtful observations and recommendations of my past President colleagues suggest the quality of leadership which NAEE has experienced over the past decade. NAEE has made significant strides in the last few years. This progress is demonstrated by our increased membership, improvements in our annual conferences, the expansion of our publications efforts, our development as a truly North American organization, and the creation of new services for our members. This growth has laid a solid foundation for future activities and accomplishment, gains that our new maturity and self-confidence will help us achieve.

My comments can be summarized in four words--mission, service, paradigm, and culture. We can build much of our future strength as an organization around activities which address each of these terms.

Mission--We need to be very clear about our central purposes and goals as an organization and begin to plan strategically to achieve these in the future. Strategic long-range planning will enable us to plot a clear course for the future. As our mission is to serve the cause of environmental education, we should be willing to expand our contacts with other EE organizations, even to the extent of discussing merger possibilities as this course of action seems appropriate. Likewise, as our purpose is education, we should address ways that we can foster environmental education as part of the general education of all students and the pre-service and in-service professional education of all teachers. These two areas are currently experiencing major reform activities in the United States and Canada and we should be part of this rethinking. Efforts to position environmental education more centrally in the mainstream of education generally will build bridges to the academic disciplines, strengthen EE as a field of study, and assist EE to withstand the political and budgetary ups and downs which accompany the public's waxing and waning interest in environmental issues.

Service--Our commitment to evaluate and expand member services must continue. Theoretically, NAEE should attempt to address the full realm of professional needs and activities of environmental educators--information, pedagogy, curriculum, career development, and research. Expanding our support for Headquarters activities is essential to achieve expanded services. Continuing review of publications is a requisite, for a direct barometer of our success in providing member services will be the fate of our desire to continue to increase membership.

Paradigm--This may be the most controversial recommendation, but I think that we should carefully consider whether the paradigm or world view of environmental education has kept pace with the rapid changes our society has experienced with the advent of electronic technologies and a changing global economy during the 1980s. I sense that we seem to be locked in something of an ideological time warp focusing on an ecological world view that is kind of an "old-time-religion" remnant of the 1960s and early 1970s. As old-time religion, EE may stand more for simplistic cliches about ecology and nature than a sophisticated field of inquiry dealing in complex ways with the myriad relationships human beings have with the physical and biological environment. These relationships are mediated by an increasingly powerful technology which, on the one hand, has a more benign environmental impact in energy, resources, and wastes than the "smokestack" technologies did, but, on the other hand, has helped to place increasing pressure on third-world environments because of the effects of these technologies on the global economy.

More emphasis on inquiry and rigorous content, as well as the process of learning, will help environmental educators to stay current with the analytical reality about which we are educating the society of tomorrow. Our responsibility takes on sobering consequences when we consider that the students that we are currently educating will live lives through the middle of the next century. Our world view needs to be flexible and adaptable, as we emphasize to our students that there are no simple ecological equations to live by in a rapidly changing world.

Culture--Due perhaps to its origins in science and outdoor education, environmental education has inadequately moved beyond science and nature in its content. Environmental problems are primarily problems resulting from perceptions and behavior arising in human culture, rather than as a product of doing science. Consequently, an understanding of the origins and nature of environmental problems requires an understanding of the structure of human society, the roots of our perceptions and behavior, and the way that human beings satisfy needs and wants. Pleas for commitment and awareness will largely fall on deaf ears without providing genuine understanding and avenues for action that both protect the environment and lead to human fulfillment. Increased emphasis upon studies in the social studies and the humanities must occur to shed light upon political, economic, social, religious, legal, and intellectual phenomena that determine what we value and how we behave.

In closing, I suggest that NAEE establish closer relationships with government agency people and the mass media in our future activities, as recommended by Bob Roth, and support Chuck Roth's recommendation (in his keynote address--Ed.) that we get involved in the general education reform movement. I heartily endorse Bill Stapp's comments about the international dimensions of environmental education, and our contact with environmental education organizations around the world.

SECTION WORKSHOPS

ELEMENTARY AND SECONDARY EDUCATION SECTION WORKSHOP

MAKING A CASE FOR WILDLIFE: USING CASE STUDIES FOR STS EDUCATION

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> Science education should produce informed citizens prepared to deal responsibly with science-related societal issues.... (Science) must instill in students a sense of responsibility, an appreciation of the potential of science to solve or alleviate societal problems and a sense of custodianship to protect and preserve that natural world with which science concerns itself.
> --Stuart Kahl and Norris Harms, 1981.

Science-related issues? What are they? What is their role in a sound general education for young citizens in a democratic society? Can we change student behavior in an appropriate direction by teaching issues? How should we go about teaching them? Where can we obtain information about appropriate teaching methods? And, what does research have to say about all of this?

Such are the questions being asked by many, many teachers as the focus of science teaching shifts radically from what one observes in the traditional science classroom. With these questions in mind, the writers hope to help teachers everywhere conceptualize the notion of the science-related social issue and provide some very real assistance in the teaching of issues. Over the past three years, the writers, with the help of the National Science Foundation, have had the distinct pleasure of helping about 100 elementary and middle school teachers implement issue instruction in their classrooms. Many of the ideas presented here are those developed both prior to and during that period of time.

What Are Science-Related Social Issues?

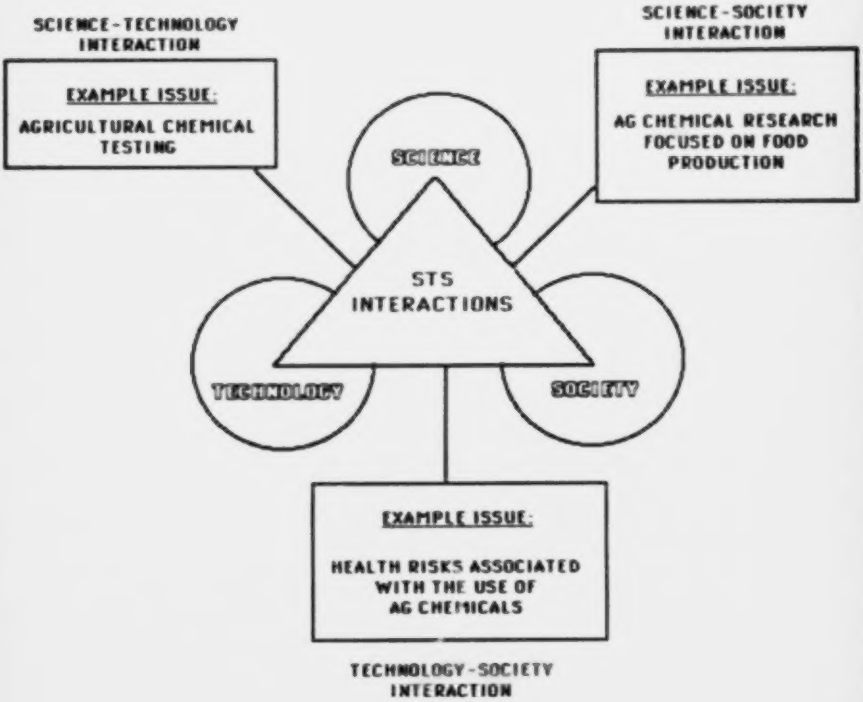
Perhaps the simplest definition goes as follows: "A science-related social issue is an issue which has its roots in science and/or technology and involves a problem surrounding which there are differing beliefs and values." Therefore, issues such as those involving abortion, genetic engineering, nuclear waste disposal, ground water contamination, human population, land-use management, endangered species, tropical rain forest destruction, desertification, recycling, solid waste management, clear-cutting temperate forests, and fisheries management would fit this definition, as would a host of others.

The writers have established two rules which govern the identification of a science-related social issue: 1) It must truly be an issue, i.e., people must, at some point, disagree concerning the status or resolution of the issue (differing beliefs and values are present), and 2) It must be of some social significance and be related, in some dimension, to either science or technology, i.e., it meets the STS test (the science-technology-society interface must be evident). Given that a problem/issue meets these criteria, one can assume that a science-related social issue has been identified.

The STS Interactions diagram represents the three basic interactions of science, technology, and society (STS interactions), i.e., science<->technology, science<->society, technology<->society. For clarification, an example issue related to each type of interaction has been provided. Each of these examples pertain to issues associated with agricultural chemicals. In the issue category termed "agricultural chemicals" there are discrete issues associated with each of the STS interactions. The reader must realize that other issue categories may relate to only one mode of interaction, e.g., there are issue categories that are probably restricted to science society interactions.

STS INTERACTIONS

THE BASES OF SCIENCE-RELATED SOCIAL ISSUES


SCIENCE-TECHNOLOGY INTERACTION
EXAMPLE ISSUE:
AGRICULTURAL CHEMICAL TESTING
SCIENCE-SOCIETY INTERACTION
EXAMPLE ISSUE:
AG CHEMICAL RESEARCH FOCUSED ON FOOD PRODUCTION
SCIENCE
STS INTERACTIONS
TECHNOLOGY
SOCIETY
EXAMPLE ISSUE:
HEALTH RISKS ASSOCIATED WITH THE USE OF AG CHEMICALS
TECHNOLOGY-SOCIETY INTERACTION

What Are the Teacher's Options?

It appears as though a teacher has a number of options for dealing with science-related social issues. Among these are: 1) to ignore issues completely, 2) to read about issues in the science textbook, 3) to develop issue case studies for presentation in the science classroom, or 4) to train and permit students to investigate issues as a part of their science experiences. Two of these options (1 and 2) appear to be rather inadequate if issue instruction is as important as professionals deem it. Although textbook treatment of issues is definitely improving, many teachers find that the textbook treatment is inadequate in terms of depth, student interests, or the locale in which the teacher finds him/herself teaching. Therefore, options 3 and 4 appear to be most appropriate if an indepth issue presentation is desired. These are also the options that will be dealt with here.

What Should Be the Outcomes of Instruction?

Just what should students be able to do as a function of instruction on issues? Speaking about STS education in the project Synthesis (1981) report, E. Joseph Piel stated that one of the outcomes should be to, "develop personal values towards an improved quality of his/her (the student's) environment and demonstrate behavior through life that indicates a desire to improve it." It is our professional opinion that this goal is a difficult one to meet in the science classroom. However, in a time of local, regional, national and international issue crises, should we expect less of ourselves as teachers and of our students? We think not!

Just what is E. Joseph Piel saying in that statement? We infer that the ultimate objective is for the student to become an effective citizen in the world community and to be able to contribute to the solution of science-related social issues. If this inference is correct, there is a plethora of prerequisites that must be attended to before that citizenship component is in hand. Among these prerequisites would be: 1) the ability to identify science-related social issues, 2) the ability to analyze issue and identify the "players" (the individuals and/or groups involved in issues) as well as their beliefs and values, 3) the ability to investigate these issues in a manner as to identify the facts surrounding them and their social, economic, political, legal and ecological ramifications, 4) the ability to evaluate the issues and determine the most effective means of resolving them, 5) the ability to develop an "action plan" which can be implemented in an attempt to resolve or help resolve the issues, and 6) the ability to execute the action plan if it is consistent with his/her values.

These are not instructional objectives familiar to most science teachers, are they? Meeting these objectives will necessitate a great commitment on the part of the entire science education community and science teachers specifically. It has been suggested that the ideal format would be for various content specialists to work together in meeting these objectives, i.e., a cooperative effort on the part of social studies, language arts, and science teachers. Regardless of the format, the citizenship outcome associated with science-related social issue instruction is a challenge of substantial proportions.

What Does Research Tell Us About Issue Instruction?

Although large numbers of studies concerning issue instruction are not available, there are enough to give us an indication of the status of such instruction and the effects produced by various approaches. Without belaboring the topic, the research indicates that:

- Although textbook coverage of issues is on the increase, there is a paucity of issue coverage available for use by the teacher. Where issue coverage is present, it tends to be at an awareness level, without opportunity for indepth student investigation of issues or training for citizenship responsibility.

- Issue instruction is not a pervasive arena for science instruction in today's science classrooms. Where it is found, it remains, by and large, an awareness activity. Thus, the really critical outcomes associated with issue instruction are not being realized.

- If citizenship performance is a desired state for students, it will not be attained by teaching issues at an awareness level. In two studies, two Illinois researchers compared an awareness-level case study format with an investigation/citizenship responsibility format and both found that the case study format resulted in far less independent citizenship behavior than the investigation/citizenship responsibility format.

It appears, then, that issue instruction must transcend a simple awareness of issues and incorporate direct training in citizenship skills associated with issue remediation. The writers are also of the opinion that, when indepth investigation skills are taught along with citizenship action skills, even more citizenship behavior will result.

What, Then, Is the Answer?

Two separate approaches are recommended by the writers, namely: 1) the case study approach, and 2) the investigation skill approach. Each approach has certain benefits and certain problems associated with it. However, in each approach the instruction must incorporate goals that go beyond what is traditionally found in science courses. What are these goals? What do they demand of the teacher? What follows is a listing of these goals and a brief description of each:

INSTRUCTIONAL GOALS FOR ISSUE INSTRUCTION

Goal I: The Foundations Level. This goal level seeks to provide learners with the prerequisite knowledge needed to understand and investigate the issue(s) in question. This would include basic content associated with the issues themselves plus knowledge associated with the nature of science, technology, and society as well as their interrelationships.

Goal II: The Issue Awareness Level. This level seeks to provide learners with the conceptual knowledge associated with discrete issues. It also involves an understanding of the "anatomy of issues" including what separates problems and issues as well as the varying beliefs and values held by societal members which impinge so heavily on the origin and resolution of issues. This goal also involves students understanding the need for them to become involved in issue investigation, evaluation, and resolution.

Goal III: The Investigation and Evaluation Level: Training and Application. This level seeks to provide learners with the knowledge and skills necessary to permit them to investigate/analyze issues and evaluate alternative solutions for resolving these issues. It also involves some form of student involvement in the investigative process, including data collection, interpretation, and communication.

Goal IV: The Citizenship Responsibility Level: Training and Application. This level seeks to provide learners with the skills necessary for making responsible decisions concerning the resolution of science-related social issues. Likewise, it provides learners with an opportunity to prepare and evaluate "action plans" for issue resolution. It supports the application of citizenship action strategies if and when students are motivated to apply their action plans.

(Note: This goal level does not require students to take action on issues; it provides an opportunity for them to do so if they desire it. The writers have long maintained that it is unethical for a teacher to demand that students take action on an issue when said action may run counter to the student's beliefs and values.)

Regardless of the approach used in issue instruction (i.e., the case study format or the investigative skill format), these goals appear to be crucial for success. Similarly, these goals are hierarchical, i.e., they function as a continuum in a linear manner with foundations preceding awareness, etc. Collectively, these goals encompass the knowledge, skills, and opportunities for application needed by students to understand, investigate, analyze, and evaluate issues and their solutions as well to develop the citizenship skills necessary to help redress these same issues.

The Case Study Format. The case study is, by and large, a teacher-directed analysis of a particular science-related social issue. It is an instructional method which utilizes both primary and secondary sources to deliver issue-focused information and skills to students. In other words, original sources are, at least initially, used by the teacher to develop a foundation of knowledge concerning the issue. Once students are oriented to the issue, the teacher provides students with the skills needed to investigate the issue on a class or small-group basis. Such a strategy could involve the students in a search of additional secondary sources of information, searching, perhaps, for subtle bits of information that can be synthesized by the class. Or, it could involve a class-decision concerning information needed or questions needing answering at the local/community level. This could well lead to instruction on the development of survey instruments (questionnaires and/or opinionnaires) and the development of a survey which the entire class would administer within the community. Of course, this would lead to the collection of primary data which would be recorded and interpreted within the class itself. Once class-decisions are made concerning what should be done with respect to the issue, the time is ripe for citizenship action training and the eventual development of an action plan which may or may not be implemented, depending upon the decisions made by the teacher/class. In short, this describes the case study.

The case study provides the teacher with a substantial amount of flexibility and control. The extent to which the issue is dealt with is in the hands of the teacher. The teacher can choose the issue, determine the methods to be used, make decisions concerning the depth to which the issue will be studied/analyzed, select the content area in which the issue will be infused, and determine the length of time to be spent on the case study.

There is, however, a price that must be paid for flexibility and control! The costs involve time, energy, and skill in putting the case study together. Most issue case studies are a "do it yourself" curriculum with the classroom teacher as the curriculum designer. Although students can be involved in the selection of a case study, that responsibility generally rests with the teacher. So, too, does the responsibility for finding and selecting original sources, be they video tapes, printed matter, guest speakers, panel members, films, field trips or simulations. Decisions must be made about the specific learning outcomes desired. Handouts must be prepared. Evaluation instruments must be designed and validated. A time and sequence flowchart should be prepared delineating the instructional steps/schedule/methods, etc. The development of a good case study is certainly not an easy task.

Several additional problems are associated with the case study format. The writers do not know whether the case study format with the citizenship component will change student behavior in terms of citizenship responsibility. However, they are quite willing to hypothesize that the teacher will notice very little citizenship behavior, if any, if the citizenship training goal is omitted. And, if that goal is met, we will hypothesize that citizenship action might well be observed but limited to the issue involved in the case study. In other words, case studies, because of their narrow focus, may not foster generalizable citizenship behavior.

Another problem with the case study format relates to students' interests. The teacher is not going to be able to meet the interests of all of his/her students using the case study format. This is a rather severe limitation when one has a number of students who would like to investigate issues other than the one(s) being studied in class. This limitation is counteracted using the issue investigation skill format.

Selected Activities from a Wildlife Case Study. In preparation for the Section workshop for the 1987 North American Association for Environmental Education Conference in Quebec, the authors sought to use a wildlife issue to demonstrate selected case study methods. Issues concerning the Pacific and Atlantic salmon were chosen as the sample wildlife issue. A complete salmon issue case study was not developed because of limited time parameters of the workshop. That is, the complete materials and methods for instruction at all four goal levels were not developed. Rather, the workshop was constructed around a critical instructional technique for Goal Level II, Issue Awareness. This technique, termed "Issue Analysis", involves the skills of analyzing an issue in terms of the following components: the problems, the issues, the players, the players' position with respect to the issue, the players' beliefs with respect to the issue, and the inferred values allied with the belief statements.

The issue analysis strategy is critical for instruction because it provides a cognitive framework for learners to process critical issue data into an organized scheme. This process facilitates an analytical comprehension of the issue. The product of issue analysis is an interpretation of an issue from a perspective of what the players believe about the issue and its resolution. An underlying assumption of this instructional technique is that issue analysis is a function of not only various facts (scientific, economic, social, etc.) but also what the players believe about the facts. The issue analysis model also assumes that the majority of issues can be analyzed using this technique.

A two-phased instructional model was utilized to deliver the issue analysis instruction for the workshop. The first phase consisted of identification and training of issue analysis skills. The second phase consisted of the application of these issue analysis skills to the workshop topic, issues concerning Pacific and Atlantic salmon. The following outline summarizes the instructional syntax for the issue analysis component of the workshop.

Case Study Goal Level II, Issue Awareness: Analysis of Issues

I. Training Phase

1. An overview of issue analysis and its components were presented.

2. A segment of a video tape program dealing with the impact of commercial land development on the grizzly bear population of Glacier National Park was made.

3. Workshop participants were organized into small groups and asked to identify the problems, issues, players, positions, beliefs, and values involved in the development/grizzly issue.

4. Each small group reported its analysis of the issue. Analyses were summarized and displayed on chart paper. Comparisons were made between groups.

II. Application Phase, Pacific Salmom Issues

5. A video tape presentation concerning the management of a Northern California salmon stock was made.

6. Small groups completed the issue analysis activities using data from the Pacific salmon video tape.

7. Small groups reported, displayed, and discussed their issue analysis.

Atlantic Salmon

8. A Canadian salmon expert presented an overview of the biology, ecology, problems, and issues pertaining to Atlantic salmon.

9. Transcripts of interviews with various Atlantic salmon players (e.g., salmon biologist, recreational fisherman, native Indian fisherman, commercial fisherman, etc.) were distributed. (The interviews had been conducted by phone and transcribed prior to the workshop.)

10. Small groups performed the issue analysis activities using the transcripts.

11. Small groups displayed, reported, and discussed their issue analysis.

Readers are cautioned to remember that the instruction activities listed above are representative of only one issue case study goal level, i.e., awareness. Further, these activities are certainly not the only methods available to approach awareness and comprehension of issues. Instructional activities for other goal levels (e.g., investigation and citizenship action) were suggested. Examples of activities at designated instructional goal levels from other case study topics were also provided.

Note: A bibliography of related materials is available from the authors.

ENVIRONMENTAL STUDIES SECTION WORKSHOP

THE PROMISE OF ON-SITE POLICIES AND TECHNOLOGIES

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Note: This paper summarizes the material presented in the Environmental Studies Section Workshop. The workshop was coordinated by Bruce Piasecki and Judith Schultz, University of Cincinnati, Cincinnati, Ohio.

America's uphill battle to clean and contain thousands of leaking toxic dumps, pits, ponds, and industrial lagoons represents an expensive trip down the wrong road. Onsite policies can be designed to reduce the amount of toxic wastes generated at the source and the use of modern chemical technologies can further minimize the need for dumping.

Since the dawn of industrialism, nations have struggled with the threat of industrial pollution. In the late 1960s and early 1970s a number of nations that recognized the extent of the threat embarked upon ambitious programs for pollution control. These programs focused on cleaning up what was coming out of the stacks or pipes of industrial facilities through the setting of emission and effluent limits that required the use of available treatment technologies.

This twenty-year emphasis on controls at the end of the manufacturing process has resulted in disappointingly slow and costly progress. Most industrial firms have followed government down this end-of-the-pipe path by installing expensive treatment units to meet the regulatory standards. Unfortunately, most of these treatment units, when they worked properly, either transferred the problem from the water to the air or from the air to water or resulted in the production of hazardous residues that were then disposed of on the land. In the current decade the shift of pollutants to the land weighs heavily on society. Many of the early standards resulted in the reduction of conspicuous pollutants such as the discharge of biodegradable organics into the rivers that were depleting oxygen levels or the emission of particulates to the air, but ignored more difficult and more serious problems like discharges of toxic organic chemicals and heavy metals.

Moreover, consistent and reliable enforcement of these controls has also proven to be elusive because of lack of government resources, heavy paperwork burdens, and the existence of too many opportunities to evade compliance in our self-monitored systems.

Perhaps the most discouraging result of this end-of-the-pipe approach has been the fostering of the idea that economics and the environment are in a direct and vicious conflict. Although the pollution control approach has produced measurable environmental benefits, the overall economic ineffiency of end-of-the-pipe solutions is becoming more apparent.

Herein rests the promise of pollution prevention. In the face of mounting environmental liabilities many industrial firms now find that when they reassess waste as being indicative of inefficiencies in their processes, a new approach based on pollution prevention is called for. The yield from this is two-fold; the economics of production can be improved at the same time the environment is protected.

Whether it is called pollution prevention, waste reduction, waste minimization, low- and non-waste technology, or clean technology, the essence of the concept is the same. Pollution, or waste, is eliminated or reduced at the source within industrial processes rather than "controlled" at the end of the pipe or stack. The terms "low- and non-waste technology" and "clean technology" are the most widely used in Europe and are broader than "waste minimization" or "waste reduction" as presently used in U.S. programs.

The United Nations Economic Commission for Europe (ECE) defines "low- and non-waste technologies" very broadly as "the practical application of knowledge, methods and means, so as--within the needs of man--to provide the most rational use of natural resources and energy, and to protect the environment." The ECE Declaration on Low- and Non-Waste Technology and Reutilization and Recycling of Wastes is a strong policy statement that encompasses reduction of pollution at the source, on-site recycling, off-site recycling, more efficient use of raw materials, and energy conservation.

The Commission of the European Communities succinctly defines "clean technology" as a technique to produce a product with the most rational use of raw materials and energy, at the same time reducing the amount of polluting effluents in the environment and the quantities of wastes produced during manufacturing as well as during the use of the manufactured product.

The force of these broad definitions rests in their advocacy of a design triangle, whereby the desires to conserve energy, save materials, and reduce waste join in a shared dynamic. "Clean technology," then, means consciously making decisions about the products a nation produces and the manner in which they are produced. This design decision, moreover, is based upon a whole array of primarily economic motives mixed with a set of broad-based environmental factors. By defining the goal as clean technology, the Europeans are truly starting at the front end, not at the trial end of the process, which America's focus on waste reduction still tends to encourage.

There are four basic technical approaches to reducing hazardous waste generation:

1. Source segregation or separation
2. Process modification
3. End-product substitution
4. Recycling and reuse

The first three approaches occur within the generator's plant, while the fourth can also occur in off-site commercial facilities or between industrial firms. No single approach or specific technique can be said to be the best one, since any or all of the four approaches may be applicable for a given generator's waste stream.

Hundreds of industrial firms in Europe have implemented the types of measures listed above to reduce waste generation. Some of the outstanding examples from Europe include the following:

A leather-tanning firm in France has implemented a series of measures for inplant recycling of effluents. These include reduction of the organic pollution from the preliminary stage of preparing the hides; recycling of the chromium-containing effluents from the baths used for tanning. These recycling measures have yielded substantial reduction in discharges of organic and chromium-containing effluents. In addition, chromium recycling generates significantly less chromium-containing sludges than the conventional treatment method, minimizing waste disposal problems. These recycling measures also yield savings in raw materials that help to offset the costs of operating the recycling systems.

An innovative thermoreactor paint-drying technique has been developed by a French company (SUNKISS). This technique has been installed at metal-finishing operations for products ranging from small metal objects to cars and locomotives. The use of this technique by the French company (Alstholm Atlantic) on two of its metal-painting lines has yielded the following environmental and economic benefits:

-A 99 percent reduction in emission of evaporated solvents that are destroyed in the catalytic heating/drying process involved in the thermoreactors;

-Elimination of the explosion risks usually associated with drying operations in the presence of solvent fumes;

-A 99 percent reduction in drying time, which increases throughput and facilitates automation on the painting lines;

-An 80 percent savings in the energy requirements for the drying operations, which yields annual savings of 1.1 million French francs. This resulted in a pay-back period of only two months on the cost of purchasing and installing the thermoreactors.

The Dornier ion-exchange columns are a simple but effective method of reducing the discharges of toxic metals from electroplating operations. Metals in effluents are absorbed onto ion-exchange resins, which are collected and regenerated at central facilities. The compactness and flexibility of the process makes it particularly suitable for small and medium-sized firms. The use of the ion-exchange columns yields improvements in product quality, savings in plating materials, and lower water usage. Differing water charges and charges yield payback periods that vary depending upon the specific circumstances of the individual metal plater. Nonetheless, these Dornier ion-exchange columns have been extensively applied in the electroplating industry, especially in Germany and France.

The use of hydrochloric acid instead of sulfuric acid for pickling steel allows for a closed-loop process in a system developed in Austria. The iron chloride produced during pickling is decomposed by heating in a furnace to iron oxide and hydrochloric gas, the acid gas is dissolved in water for reuse, and iron oxide is recycled to the blast furnace. The process allows for nearly a 90 percent reduction in acid usage and eliminates sludge generation from neutralization of the acid as a treatment process. These savings make the capital investment profitable.

Chrome plating of plastic requires preliminary etching that is performed by dipping the plastic parts in a sulfuric/chromic acid bath. Prior to the institution of the recycling process by this French firm, the whole bath was sent to a hazardous waste treatment facility when the hexavalent chromium content of the bath was depleted. The recycling process utilizes electrolysis to reoxidize trivalent chromium in the bath to hexavalent chromium permitting recycling of much of the bath. The firm now sends only four tons per year of spent etching bath off-site for treatment instead of the fifteen tons per year previously shipped off-site, and due to savings in sulfuric and chromic acid losses and avoided treatment costs the capital investment paid for itself in fifteen months.

The most obvious, but often overlooked, lesson from these European experiences is that detoxification technologies exist and reduction strategies are possible that virtually eliminate the need for land disposal of untreated chemical wastes.

Among the benefits from pollution prevention are the following:

- Reduced worker exposure to hazardous chemicals
- Less hazardous waste transported on the highways
- Reduced need for off-site hazardous waste facilities with their attendant environmental and political problems
- Increased industrial efficiency through raw materials and, in some cases, net energy savings
- Reduced liability for leaking dumpsites and inadequate off-site disposal practices
- Avoidance of increasing disposal costs and administrative costs inherent in cradle-to-grave management.

Despite the other staff and production demands competing for resources within a corporation, the benefits of pollution prevention are gaining in value. If defined as a tool for improving the overall bottom line rather than as another technical fix to improve plant yields waste reduction decisions can move higher up the corporate ladder into the financial realms of upper management, generating enthusiasm among a company's highest fiscal and risk-control managers.

NONFORMAL EDUCATION SECTION WORKSHOP

REACHING NEW AUDIENCES

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In October, 1977, the first Intergovernmental Conference on Environmental Education was held in Tbilisi, USSR. Here delegates from around the world agreed upon the role, objectives, and guiding principles of environmental education in a series of recommendations. Their message was clear: environmental education should be provided for all ages, at all levels, and for all peoples, in both formal and non-formal education.

In October, 1986, the Non-Formal Section of the North American Association for Environmental Education convened in Eugene, Oregon, to assess the progress made in non-formal environmental education in North America in the last 9 years. Agreeing that nature centers, resource agencies, youth organizations and similar programs perform a needed function in non-school programming in their communities, the group recognized that few such operations meet the needs of their entire population. Instead of being integrally linked to their whole community, most centers and agencies tended to focus almost exclusively on the dominant culture--usually the white middle class. In addition, many organizations found that they were, in truth, only serving the elementary school children of the white middle class.

For environmental education to succeed as a foundation of social change toward a sustainable and desirable quality of life for all people, non-formal educational institutions must take steps to reach all population groups in their service areas, at all ages and at all levels. We are not without experience and leadership as we embark on this task. Many non-formal organizations are already responding to the desire to better serve their community and are expanding their programming to groups who have not traditionally been involved in environmental education. A few non-formal centers have been established specifically to meet the needs of minority groups or urban populations.

Despite the great opportunity and need, most of the continent's non-formal environmental education facilities and programs are looking for directions, guidance, and assistance as they begin the process of reaching new audiences. Some are beginning to realize that as urban schools become more multicultural, each school group brings a greater diversity of children to their facility, and wonder if the old programs still suffice. Others perceive the new audiences as an avenue for new funding and growth as they try to hire more staff and carve a more permanent niche in their community.

In October, 1987, the same Non-Formal Section of NAEE gathered in Quebec City, Quebec to explore strategies for Reaching New Audiences. The workshop brought together people who have successfully implemented environmental education programs for minority groups and people who are seeking ideas to move their programs toward serving their entire community. Keynote speakers T. Spence and Rebecca Judy layed a foundation for the exploration of strategies to attract different populations to educational programs. Case studies from organizations who reach new audiences were compiled and distributed. Activities designed to assist staff members in clarifying values and attitudes regarding people who are different were explored.

The participants generated a set of guidelines and strategies to assist organizations seeking to develop new programs for different populations. To some, the new audience was parents, to others--tourists, and still others sought to include racial or ethnic minorities. These guidelines do not attempt to provide a mandate or magic formula for any one target audience, nor for all. This brief version of their suggestions may trigger new avenues for reaching new audiences.

The key ingredients that are needed to develop good programs that reach new audiences are:

--research the audience, using as many sources of input as possible, such as, members of the target audience, academic community, business, government, social agencies, education systems and organizations.

--involve representatives of the target group in program planning and development and adapt to their frame of reference.

--tailor the approach to a specific audience and then be consistent in its application

--design programs to have relevance to the audience's culture and local environment.

--identify issues that concern this new audience and capitalize on them. Make appropriate links between you and them through EE and the issue: the basic needs: five basic elements for survival (fire, water, air, land, and energy), or the economic system and hidden cost of this lifestyle, or stress resolution.

--identify the political aspects of the prospective audience--important personalities, government agencies--who could help improve your organization's credibility, your program, your publicity strategies, and your efforts in general.

--do outreach; go to those who won't come to you.

--work within existing channels to reach minority groups.

--design the program to involve the target population. For example, if you hope to attract families, have incentives to attract them, i.e. party, picnic--any reason other than EE programming.

--be a resource for the needs of the target population; work to meet their needs and weave in EE.

--share information with similar organizations and learn from each other.

--understand different cultural perspectives on the environment.

--be aware that audiences are comprised of individuals who are attached to others, like parents, children, and siblings, who could become involved.

--provide appropriate role models and mentors.

--spread the teaching responsibilities around--empower high school students or older adults to be guides or teachers.

The participants further defined seven recommendations for program development strategies for new target populations. These are briefly explained below:

A. The four part task of developing relevant programs for new audiences begins with research. The audience is the very axis around which the program will revolve, and consequently, the program staff must understand all relevant aspects of the audience. Careful research can help determine audience needs regarding programs and services, characteristics such as age, languages known, religion, culture, etc., and the expectations this audience will bring to your center or agency. Research can be accomplished through surveys, opinionaires, consulting research literature, getting to know people, asking questions, working with organizations that service the audience, observation, etc.

Audiences can be researched by identifying people and organizations in the community who successfully work with them. Networking and linking small programs with them can give your program initial credibility, and give you good experience. Examples: Headstart programs, Urban League, civic groups, museums with a focus on minority populations, schools or individual teachers, university teachers with a good reputation, etc.

Along with researching the audience, it may be appropriate to explore your center. How much money can you spend? How many staff will work on the new program? How large is the commitment to reach new audiences? Before you advertise, do you need to do some ´behind the scenes´ organizing?

B. The second step is to plan the program. Careful attention should be paid to the planning process, not just the outcome. The ideas gleaned from the research phase should be used in the program plan, and members of the target audience should be included. It is important to understand how the goals of the program help meet, or even conflict with the cultural norms and goals of the audience. Active leaders of the target group should be contacted and involved in the planning process.

It may be useful to list your own preconceptions about the target community and examine these carefully. Disregard inaccurate and unhelpful perceptions. Also, have respect and sensitivity for mores and norms of the target audience. This necessitates good research.

C. The implementation of the programs involves the preparation and development of support materials and teaching staff who will be able to effectively communicate with and empower the audience. The planning staff should be involved in the program implementation, after an effective training program. A tool to monitor program progress, provide crisis support, answer questions and allow for continual improvements should be developed. All materials and activities should be screened by someone sensitive to the culture of the new population. Control of the program and/or their education and action should ultimately transfer to the new community.

D. Finally, the evaluation of the new programs should be at two levels: before the implementation during the planning process, and then after the implementation. Before the implementation, the program should be evaluated for its efficacy, authenticity, appropriateness for the target audience, correctness, and ability to meet the objectives. It would be particularly critical that a member of the target audience review materials that may be insensitive to the audience's culture.

After the initial evaluation, a program should be implemented or field tested with a small and familiar group to obtain frank comments. If any modifications are required, they can be done at this stage.

Evaluation is an ongoing process and a regular one, too. A program should be evaluated at definite intervals. But the duration of intervals depend on the time, scope, and constraints of the program and the organizing institution.

The development and implementation of programs for new audiences may require resources that the agency or organization does not yet have. The participants elaborated on three types of resources that may be needed.

A. New programs need leadership. More than any other component, the success of a new program lies largely in the strength and commitment of its leadership. A half-hearted attempt is likely to meet with frustration and insurmountable obstacles. A strong leader is often able to overcome the same frustrations and obstacles with creativity, dedication, enthusiasm, and vision. Still, a leader does not function in a vacuum. Leaders need support, organizational backup, volunteers, and action to feel rewarded. Assuming the leadership is present, below are suggestions to facilitate the process of reaching new audiences.

- Form an advisory committee with representation from the new audience and a broad coalition of supportive organizations which bridge socio-economic partitions.

- Develop clear, ambitious but realistic goals, objectives, and expectations for the project and the people involved.

- Carefully work with the staff of the project to identify inappropriate attitudes and values that may affect the programs. Involve members of the new audience in a variety of situations and training sessions to help your staff understand the new culture.

- Reward your staff with recognition of their efforts to develop unique programs and pave new roads for environmental education.

- Share your success with other organizations and professional organizations.

B. Most typically mentioned in the discussion of new programming--organizations need funding. New audiences are often neglected if they aren't able to pay for their programs. In order to reach new audiences, centers and organizations may have to seek new sources of funding.

Potential sources of funding include people from:

- --clergy and churches
- --boards of directors of organizations
- --service and professional organizations
- --corporate leaders, business people, banks, financial networks
- --volunteers
- --foundations
- --government: formal public school sector, agencies for population subjects
- --individual contributions
- --and anyone who can connect you with one of the above!

C. The last resource we examined, vital to the continuity of an organization and the establishment of services to a new population is community support. This was defined as support within the target group and support from the community at large to work with the target group. Such support can take many forms: money, materials, hugs, endorsements, advertising, personnel, etc.

Community support can empower groups to accept projects and programs as their own. It is important for them to continue the programs. A group outside of the target audience may even take on your project: build coalitions.

For some organizations or agencies, it may be important to develop a controlled structure for approaching new groups regarding support. Develop a contract with them which should be followed if they wish to have your agency's endorsement. The agency needs to clear the way to be able to accommodate policy changes which may be necessary to gain support from community groups.

It is possible to begin a program without full support of the community provided your implementation program includes an integration plan to increase and encourage support. All sectors should be kept informed and provided with opportunities to come on board with support even though they may have refused in the past. There is a strong need for an adequate time frame to develop support; it is probably better to only approach those sectors you have time to cultivate.

There is a vital need to get key community leader support and grass roots support. Different strategies may be needed depending on whether the agency is inside or outside the target audience.

NOTE

Further information and descriptions of the workshop materials, activities, and participant-generated guidelines are available in a booklet entitled: Reaching New Audiences: A Handbook of Guidelines, Case Studies, and Resources for Environmental Educators which is available through NAEE Headquarters for a small fee.

CONTRIBUTED PAPERS

NEW MODELS FOR NEW PARKS

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The next five to fifteen years will be a critical time for the preservation of land in America. While it might appear that America has ample public recreation areas and open land, changing demographics have resulted in a mismatch between Americans and accessible open space. The National Park Service reports that the number of Americans visiting remote park areas is declining, while the number of visitors to parks near urban areas is increasing. Americans are taking more trips but are not traveling as far. Thus, one of the challenges facing local, state and federal park planners is determining how to provide quality open space areas and outdoor recreation opportunities close to home. (President's Commission, 1987)

It is becoming clear that the need to preserve our country's open space cannot be met simply through traditional government ownership and control of land. America's vast federal estate, the bulk of which lies west of the Mississippi River, was acquired primarily through "original ownership" by the federal government. The first major national park land actually purchased by the government was the Cape Cod National Seashore in 1961. (Foster, 1985) Although nearly six billion dollars' worth of public park and recreation land has been acquired since then, acquisition has not kept pace with authorization for such purchases due to a lack of sufficient funds.

Private land trusts have come to play a crucial role in the conservation effort because they can quickly acquire critical lands, especially those threatened by immediate development. One such trust, the Nature Conservancy, acquires approximately 100 million dollars' worth of U.S. land each year. (Nature Conservancy, 1987) Another, the Ottauquechee Land Trust in Vermont, has protected more than 25,000 acres over the past seven years. (Ottaquechee Land Trust, 1987) Yet, even with these efforts, land acquisition cannot keep up with the growing need for land protection. A recent estimate of the cost of "essential" acquisition for the national forest system alone exceeds $5 billion. (President's Commission, 1987)

Land preservation requires a particularly great financial commitment in the case of scenic landscapes which are the result of cultural as well as natural forces, such as farms, fishing villages and ranchlands. Protection of such land goes beyond acquisition; it demands a strategy that provides for continuation of traditional cultural activity. Without such a strategy, a rapid decline in the very resources for which protection is sought could result.

The cost of land acquisition combined with the fact that local interests resent "outsiders" occupying their turf is forcing government to cooperate with developers and local agencies to enact land protection measures. Rather than displacing local control, new approaches to land protection integrate local interests in a strategy that relies on law rather than ownership to protect open space, conserve cultural landscapes, and ensure public access to these areas. In this way, state and federal government remain active in land protection, but the orientation changes. The government role shifts from dictator to guide, from authority to facilitator.

An important first step in helping local developers plan is identification by state and/or federal agencies of critical open space, sensitivity areas and unique habitats. This is followed by zoning and the establishment of other regulations that limit development in environmentally sensitive or hazardous areas. Impact fees and mandatory dedication ordinances requiring developers to provide recreational and other facilities are being used in many cases. A relatively new form of compromise is the transfer of development rights (TDR), which allows developers to increase density in some areas in compensation for greater restrictions in more sensitive areas.

These tools and others are being used to protect lands of national, state and local significance. At the national level, the Pinelands National Reserve (NJ) and the Upper Delaware Scenic River are examples of areas where innovative management strategies that rely on locally generated zoning ordinances and master plans have been used to ensure resource protection. The comparatively small federal investment in these areas has provided protection on a scale that could not have been achieved through direct federal intervention. Federal funds have been used to support local actions and preserve local control. (Often, local governments wish to preserve existing conditions but, lacking federal support, are unable to go toe-to-toe against large developers.) In both cases, the management strategy has allowed the local economy to continue functioning and local residents to continue living and working in the area. In addition, public involvement in the planning process has increased public awareness of the valuable resources in the community. (Batory & Sutro, 1987; NPS, 1986)

Various states, too, have adopted a number of incentive schemes to encourage local communities to preserve valuable landscapes. Wisconsin's Managed Forest Law, for example, levies lower taxes on owners of ten acres or more who use an acceptable forest management plan that includes actions to enhance wildlife, watersheds and aesthetic values. New Jersey's 1984 Open Lands Management Act provides funding (at the modest cost of $14 per acre) to private property owners for developing and maintaining their lands for public recreation. Virginia's authority to create local agricultural and forestry districts has resulted in almost one-half million acres of private land voluntarily reserved as open space. Districting guarantees protection of the scenic landscape and provides for use value taxation rather than market value (development value) taxation. (President's Commission, 1987)

These regulatory approaches to land protection are generally supported by people with a strong sense of place and commitment to the community. On the other hand, many large landowners, speculators and developers would just as soon "get compensated and get out" if their ability to transform the landscape is to be restricted. These people often fight what they consider to be "confiscatory regulation." Two such cases were recently considered by the Supreme Court, and the decisions immediately sent fears throughout the conservation community. These decisions have had far more bark than bite and in fact have left intact the authority of states and local communities to act in the public interest.

In the first of these cases, the First Lutheran English Evangelical Church of Glendale (CA) sought compensation from the County of Los Angeles in a suit alleging that an interim flood control ordinance adopted in 1979 has deprived it of "all use" of a 21-acre property it owned. The court has long held that governments have wide latitude in regulating the use of property in the interest of public safety, health or welfare without compensation, although a regulation that "goes too far" may constitute a "taking" of private property for public use. In this, the Court held that the church was entitled to compensation if it could prove in further proceedings that the regulation was so burdensome as to constitute a taking. It did not define, however, at what point a regulation constitutes a taking. The decision dealt only with the interim nature of the flood control ordinance, stating that compensation for a temporary taking is warranted. (First Lutheran)

Despite the narrowness of the decision, local governments may be more wary of regulating land use if there is a possibility that compensation must be paid for temporary "regulatory takings." Indeed, in his dissent, Justice John Paul Stevens said that this "dangerous" decision would cause a "litigation explosion" and that "much important regulation will never be enacted" because regulators may be deterred by fear of subjecting their governments to damaging liability. (Ibid) It is, therefore, in the interest of developers to make more of this decision than actually exists and thereby further intimidate regulators. (Nollan V. California Coastal Commission)

In another recent major land use case, an oceanfront property owner in California wished to replace a small bungalow with a large, two-story structure. The California Coastal Commission, a state regulatory agency empowered to ensure public access to the state's beaches, approved the development but required an easement guaranteeing the public lateral access to the beachfront. The property owner refused to donate the easement and sued the Commission.

Though the Court ruled against the exaction, once again, more has been made of the decision than is warranted. The Court ruled only that the requirement for lateral access was not related to the requested development since no legal access existed at the time the development was proposed. The Court did not restrict the ability of government to regulate land use in the public trust. It did, however, put regulators on notice that conditions places on developers must be closely related to the impact of development activity. (Nollan)

These Supreme Court decisions, along with the recent actions of local, state and national agencies and private land trusts, indicate that we can indeed keep our communities attractive places in which to live, work and play. This will not be accomplished through the free play of market forces, but will require a conscious public-private initiative. We must act now--not only because of rapidly escalating land prices, but because the present pace of land transformation threatens to irrevocably alter the American landscape. The tools are before us. We need only to pick them up and get to work.

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ENVIRONMENTAL EDUCATION IN THE YEMEM ARAB REPUBLIC: A CURRICULUM IN DEVELOPMENT

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Introduction

There is an increasingly important need for students and citizens in the Yemen Arab Republic (Y.A.R.) to gain the knowledge, attitudes and skills necessary to alleviate poverty, improve individual safety and comfort, and increase nutritional levels while at the same time reducing environmental risks. The ecological problems the people face today in the Y.A.R. may be symptomatic of a general lack of environmental knowledge and concern on the part of today's citizenry, along with a belief that little can be done to solve environmental dilemmas such as air and water pollution, hazardous wastes, soil erosion and other abuses of the natural resources.

The Belgrade conference (UNESCO-UNEP, 1976) stressed the development of a world population that is aware of and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones. In light of this statement a well-planned program of environmental education for the Y.A.R. should strive to provide factual information and practice in the thinking skills that lead to an understanding of the total biophysical environment, develop a concern for environmental quality which will encourage citizens to work toward solutions to biophysical environmental problems, and inform citizens as to how they can play an effective role in achieving the goals derived from their knowledge and attitudes.

Project Objectives

While environmental education has been a concern in most developed countries for the past 20 years, it is only now coming to the forefront in the Third World countries such as the Y.A.R. Al-Madhagi (1984), in a survey of teachers from the Y.A.R., determined that there is a general lack of environmental education materials and programs in Yemen and that there are no teachers specifically trained in environmental education.

This effort initiates the formal development of a rationale, key concepts, goals, general objectives and intended learning outcomes for environmental education in the Y.A.R.

Procedures

The proposed environmental education curriculum was designed to meld environmental education issues, concepts and principles. This was accomplished by studying ecological processes from a perspective of biological and geographical concepts, both of which are related to the Third World countries and specifically the Y.A.R. Also, the ideas that were included in the proposed environmental education curriculum had their genesis from a thorough review of the literature (e.g., Bennett, 1972; Blum, 1981; Dushane, 1974; Fleetwood, 1976; Hungerford, 1980; Knamellor, 1980; Knapp, 1983; Leonard, 1980; Stapp, 1980; Wright, 1983; and Za´rour 1981). The review provided a broad understanding of environmental philosophy, education, goals and materials that have been developed and published in the U.S.A. and includes developed comprehensive programs such as the Environmental Education Kansas State Plan (Berg, et al, 1984), Environmental Education: A Maryland Approach (Latham, et al, 1974), and The California Environmental Education Guide K-12 (Rose, et al, 1981).

Two types of validity were used in this study. Content validity was used to measure the degree to which an item measured an intended content area. Criterion validity was used to measure the extent to which the items´ performances were related by comparing each item´s congruence with the goals and general objectives.

The development and validation of the environmental education curriculum consisted of four important steps. The first step was accomplished at Kansas State University, where a panel of four environmental education experts was used to validate the curriculum program as a whole.

The educators were asked to rank each goal, general objective and intended learning outcome according to the following criteria: congruence, importance, clarity, appropriateness and completeness. A Likert-type scale was used to gather responses for each of the measurement criteria. The reviewers were also asked to recommend changes and corrections they thought necessary to improve the items.

Applying the ratings and suggestions from the panel of experts eliminated several items which were rated as ambiguous or not important by the educators.

The second validation step used a panel of 42 experts selected from throughout the United States of America. Again, if the panel was unanimous in its decision that an item needed changing or rewriting, the researcher used these comments and suggestions to revise and improve each statement.

The third validation step involved the Yemeni teachers studying at universities in the U.S.A. The rationale for this step of the validation process was to acquire more ideas as they related to the Yemeni environment. This process was also used to validate the need for the environmental education program and to identify any deficiencies that related to implementation of the proposed environmental education curriculum in the Yemeni public schools.

The fourth and final step of the validation process of the environmental education curriculum program was completed in the Y.A.R. The proposed program outline was given to eight educators at the Ministry of Education and at Sana's University. This step was crucial because the program was reviewed by those persons who make the educational program decisions in Yemen. This review provided insight to the limitations and inadequacies of the program.

The final product consisted of a validated environmental education program rationale, 33 key concepts, 10 goals, 50 general objectives and 291 intended learning outcomes.

Discussion

The resulting validation of the proposed environmental education curriculum program outline provides a structure of important ideas for use by Yemeni educators at all school levels. The plan constitutes a valid, viable and suitable framework for guiding or infusing environmental education into the existing curriculum and for the development of environmental education materials.

Too little attention has been given to environmental education in the existing Y.A.R. school curriculum. Generally, this has been due to an incomplete understanding of the importance of environmental education and the difficulty of establishing an interdisciplinary program in the existing school framework. Specifically, lack of adequate teacher preparation in science and science education, single subject curriculum material, inadequate financing, outdated teaching strategies, rigid time schedules, school isolation from the community, subject matter requirements and tradition-based inertia are some of the factors that constrain efforts in environmental education.

Applying the ideas for the proposed environmental education program will help guide the students along the path from a first consciousness of the value of nature, toward obtaining knowledge and skills that reveal the power people have to manage nature.

A key to a successful environmental education program lies in its proper evaluation and the communication of the results to those decision-makers responsible for curriculum design, program development and implementation. To achieve this purpose, the Yemen Ministry of Education and educators in all sectors should foster the development and dissemination of educational activities and materials which will assist Yemeni students, teachers, and administrators in the perception, appreciation, and understanding of environmental principles and problems, and in the identification and evaluation of possible alternative solutions to the problems and the assessment of their benefits and risks.

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THE NOVICE EXPERIENCE OF ORIENTEERING: A CASE STUDY

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Introduction

What is orienteering? Orienteering is a traveling navigational search. It is a physical endeavour through undulating forested environment following a cross country route to complete a prescribed course in the least amount of time by locating a sequence of orange and white control flags. The sport of orienteering as an environmentally based activity is unique because it epitomizes an alliance between integrative learning, physical activity and the environmental dimension of an outdoor experience. It is the outdoor setting that provides the starting point in initiating a liaison between navigational skill and physical activity within an orienteering experience of each individual.

Orienteering began in Sweden during the 1920s. It was fortuitous that in Scandinavia there were extensive and undulating forests that were ideally suited to orienteering. Also, Sweden has a unique law, "every-person´s right," stating that the countryside belongs to all people. It was this natural setting that was conducive to nurturing the birth of a sport for everyone.

The Study Context

It is interesting to note that only four theses were located which specifically focused on an instructional perspective of orienteering and none of these studies had been completed in Canada.

This school based research addressed the following issues and sought to understand their influence upon the study question: "What is it like to orienteer as a novice?" Sub-Questions relate to:

-How did acquisition of orienteering skills impact upon novice orienteers?

-What was the nature of the self-learning experiences of novice orienteers?

-What were novice orienteers aware of in outdoor settings?

For this study six months were spent with Grade 11 students in an outdoor oriented P.E. program. Proximity of the small urban school to an extensive forested area provided an ideal setting for the study. My role as a researcher evolved from orienteer to participant observer to orienteering teacher. During an eleven lesson unit, the students learned fundamental skills of navigation using map and compass. This experience culminated with a cross-country orienteering event held in an ocean side park, an outdoor setting that was unknown to the students.

Case Study Methodology

In this school based research the case was the investigation of orienteering as experienced by novice participants and the research question, "What is it like to orienteer as a novice?" was posed to Grade 11 students. The accompanying sub-questions supported the intent of the study to reveal a deeper understanding of how the students reacted through their physical activity to an outdoor learning environment and how teachers contribute in a meaningful way to this educational process.

A commitment to a lengthy period of time is inherent in case study research, not because the field work takes so long to conduct, but rather to allow a mutual trust to be established between the students and researcher. Another contextual component was the presence of the researcher in the students' outdoor oriented physical education program, wherein active participation as a teacher became significant to the understanding of these young people in the context of their physical activity in an outdoor setting.

The collection of data through observation, field notes and literature review culminated in an open-ended style of interviewing the students. These varying methodologies contributed to a framework for describing the phenomenon of orienteering. In this study, the predominant focus was the descriptions of students' orienteering experience. However, personal supporting evidence came from other experienced orienteers and the authors of instructional texts.

This case study articulated the human phenomenon of orienteering by implementating a research design that integrated the method, study context, and orienteering to better understand the sport as experienced by the novice participants.

Thematic Analysis: Reflection on the Themes

Written documentation and transcribed responses from the interviews were gathered and the data grouped under fifty sub-headings. These were subsequently arranged under six main themes which emerged as the most representative of the student´s orienteering experience in response to the study question.

The "fear of being lost" emerged as an important component in the "Navigation" theme. The students, with initially limited background, gradually were less hesitant as their skills were more effectively used in progressively challenging navigational situations.

The "Physicality" theme reinforced the fact that the running is the only physical dimension of an orienteering experience. The students began to appreciate the importance of fitness in relation to physical mobility and more importantly, they liked the idea of running for a purpose in orienteering.

The "Awareness of Self-Individuality" theme was portrayed by the students through an emphasis upon independent navigation, while traveling along in an unknown forested environment. These concepts were consistently reinforced throughout the instructional unit. Successful course completion was dependent upon overcoming feelings of self doubt and recognizing an ability to make sound navigational decisions under pressure.

The "Competition Within Participation" theme provided some interesting insights from the students as they suggested "setting goals", "going at own pace" and "experiencing a sense of accomplishment" after individual endeavors were important in their navigational activity. The challenge of self, before comparison with others, is the philosophical stance of orienteering.

In the "Time and Space Relationship" theme, the relevance of time to these novice participants, as an integral part of living, appeared to be reflected initially in speed of travel and fast course completion. Another interesting dimension was the different feelings of time experienced by each student and these were dependent upon the navigational problem and physical setting of the individual at a particular point in time during the event.

Awareness of space initially impacted as the size of the forest to the students. Later, as a more confident relationship developed between map and environment, they were able to experience improved understanding of spatial concepts in orienteering, as these related to different types of environmental and spatial patterns in nature.

The final theme was "Environmental Awareness". The student's understanding that orienteering was grounded in its own context, a natural outdoor setting, became more realistic as synchronization of map and environment improved during the unit. Better use of observational skills by the students suggested a more conscious appreciation of being an integral part of and being changed by their surroundings.

Learning Outcomes

It is clearly evident from the earlier discussion that the study question made an appreciable impact upon the students. This first time encounter with orienteering permitted these novice participants to share in a personal way their experience of the sport. Their animated responses suggested involvement reflecting the extent of learning within the experience itself and its effect upon the individual student as the instructional unit progressed. This sense of involved learning was revealed through the indirect responses to the sub-questions posed in the study relating to skill, self and setting.

The initial question recognized the relevance of effective navigational techniques early in student activity as newly acquired skills were used in a sequence of navigational experiences. Successful decision making was reflected in an increased level of confidence, as poor navigational judgement became less problematic.

The second question acknowledged the realization by the students that they were able to be self reliant and not dependent upon others to resolve navigational dilemmas. Their experience of being alone revealed that for some students it was the first time they had had a truly personal encounter with themselves. Others found they had an innate affinity for being in a natural landscape as a self learning experience by the students and this was verified through the sharing of such feelings as the joy of moving, the thrill of seeing their surroundings in a new way or knowingly taking a navigational risk.

The final question revealed that the student participants had a general level of environmental awareness. However, in unfamiliar settings, more attention was given to specific details to facilitate particular navigational endeavors. All students recognized the need to establish a more personal relationship with their surroundings as an important factor to assist in mobility through a forested environment. Some students were generally more aware of the setting than others, but most commented on the "nature" dimension of their orienteering experience.

Summary

This study set out to respond to the question "What is it like to orienteer as a novice?" In doing so, orienteering has been described as an integrative and holistic experience in which individuals engage in physical activity in an outdoor setting. Orienteering is an environmentally based activity. If it is grounded in its own context, a natural outdoor setting, then that is where the sport must be experienced. It is a travelling navigational search to which each individual responds in a unique way to his/her surroundings. Finally, it is virtually impossible not to be captured by the "magic" of the forest!

NOTE: A bibliography is available from the author.

ENVIRONMENTAL INNOVATIONS IN THE PACIFIC NORTHWEST: A CULTURAL PERSPECTIVE

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> I have seen a lot of scenery in my life, but I have seen nothing so tempting as a home for man than this Oregon country....You have a basis for civilization on its highest scale, and I am going to ask you a question which you may not like. Are you good enough to have this country in your possession? Have you got enough intelligence, imagination and cooperation among you to make the best use of these opportunities?
>
> Lewis Mumford, to the City
> Club of Portland, 1939

Introduction

This paper provides a summary report of a two day colloquium entitled, "Environmental Innovations in the Pacific Northwest: A Cultural Perspective," sponsored by the Oregon Committee for the Humanities, Northwest Association for Environmental Studies and the University of Oregon, in September of 1986.

The purposes of the colloquium were:

--To highlight the achievements of the Pacific Northwest in environmental management to a national and international audience;

--To stimulate the development of environmental management innovations throughout the world by example and analysis.

Utilizing a case study approach (often presented by persons directly responsible for the actions) this symposium explored the political, economic, social, legal and environmental circumstances of each innovation. A summary of the symposium is presented in Table 1. A bibliography of references used for the case studies is available from the author.

Table 1. Summary Program of the Symposium "Environmental Management Innovations in the Pacific Northwest: A Cultural Perspective"

Session I. Innovations: Washington and British Columbia
Leader: Tom Rainey

Case Study 1: Fisheries Conservation and Allocation--Duane Phinney

Case Study 2: Bilateral Skagit River Treaty--Ben Marr

Session II. Water Resources and Pollution
Leader: John Charles

Case Study 1: Willamette River Cleanup--Harold Sawyer

Case Study 2: Minimum Streamflow Legislation--Mary Hanson

Session III. Woodstove and Pesticide Regulations
Leader: John Opie

Case Study 1: The Regulation of Woodstove Pollution--Robert Lebens

Case Study 2: Pesticide Reforms--Mary O´Brian

Session IV. Solid Waste Management
Leader: William G. Berberet

Case Study 1: The Oregon Bottle Bill--Don Waggoner

Case Study 2: The Opportunity to Recycle Act--Lori Parker

Session V. Northwest Regional Power Plan
Leader: Dan Leahy

Case Study 1: The Northwest Regional Power Plan--Roy Hemmingway

Session VI. Land Use
Leader: Dan Goldrich

Case Study 1: Oregon Land Use Planning--Jonathan Raab

Cultural Perspectives

Physical. One reason for the commitment to environmental protection in the region is the beauty, bounty, and relative isolation from major urban, industrial and transportation centers of North America. Dr. William G. Berberet, an historian and Dean of the College of Liberal Arts at Willamette University, commented on the environmental attitudes resulting from this isolation:

> The historic and geographic isolation of the Northwest, combined with its natural beauty fostered a close identification with the land on the part of early settlers. In coming to Oregon, pioneers endured six months on the Oregon Trail, or three months at sea on the route around South America. After such depravation, the region must have looked to many like a "Garden of Eden." As a matter of fact, this is how Oregon was promoted in the East--an image which attracted a certain type of settler who sought a quality of life rather than a quick fortune.

Human Attitudes and Values. The settlers of the Pacific Northwest were a conservative, pragmatic group of people who, for the most part, loved and respected the natural world and had a stewardship attitude toward resource management. This was expressed by Dr. Tom Rainey, an historian who is currently writing a book on the environmental history of the southern Puget Sound Region:

> In the Pacific Northwest, settlers had a feel for living organisms and resources--they are not just economic resources, but rather cultural, historic and spiritual entities. For example, in the Pacific Northwest, salmon are not just an economic resource to be exploited. Rather, they are a cultural resource, "the soul of the Pacific Northwest."

Economics. In his commentary on Oregon's Land Use Planning Program, Dr. Dan Goldrich, Professor of Political Science at the University of Oregon, commented that the deep value base of the region allowed decision-makers to transcend the old "economics versus environment" debate in developing both the land use planning program and the Northwest Regional Power Plan.

> There is an analogy to land use planning for conservation and development in the Northwest Energy Planning where federal law required the region to develop a 20-year electrical energy plan. The Northwest Energy Plan adopted in 1983 relies on conservation as the priority energy resource of choice because it is both least cost economically and environmentally and it provides a certain stability and predictability in basic energy resource development. Thus, in energy as in land use, the environment-economy debate has been transcended. This is worth noting and is an important achievement in the Pacific Northwest.

Political. A. Tradition of Direct Democratic Control of Public Institutions: Perhaps the most frequently mentioned cultural reason for environmental innovation in the Pacific Northwest is citizen participation in political decision-making processes. The region has a strong tradition of direct democracy, begun at the turn of the century. This is reflected in the development of a strong municipal reform movement; aggressive populist farm movements (with the development of unions and a strong grange movement); development of populist initiative, referendum and recall programs; and culminating in the creation from about 1910 to 1937 of the unique federal energy system of the Bonneville Power Administration. According to Dan Leahy, Professor of Public Affairs from the Evergreen State College and an authority on labor and energy policy in the Pacific Northwest:

> The people of the Pacific Northwest basically combine values of equity, social justice (e.g. public access to institutions) and democracy (e.g. elective control of public resources) in the creation of public institutions. It is the application of these values to the formation of regional institutions that produces successful innovations in the Northwest culture.

The close relationship of citizens with public institutions fosters a climate where ideas and innovations flourish. This is manifest in the Northwest Regional Power Plan, and a plethora of public power agencies--public utility districts, cooperatives and municipal electrical systems seldom seen in other regions.

B. The Ballot Initiative and Direct Citizen Participation in Government: As mentioned previously, at the turn of the century, initiative, referendum and recall elections were established in Oregon to prompt direct citizen input into state decision-making. Two examples indicating how instrumental the ballot initiative has been in fostering and promoting environmental innovation in the regional are the Willamette River Cleanup and the initiatives to weaken or eliminate Oregon´s Land Use Planning System.

In a discussion of the Willamette River cleanup, Harold Sawyer, the administrator of the cleanup effort for 20 years, recalled that in 1937 the Oregon State Legislature passed a bill for an aggressive remedial water pollution cleanup of the Willamette River, which the Governor promptly vetoed. Following this, in the November 1938 general election, the citizens of the state passed an initiative petition by a 3:1 vote to create the Oregon State Sanitary authority that initiated the cleanup effort. According to Sawyer, without the resounding passage of the ballot initiative, the remedial program would likely not have been so successful.

The ballot initiative has also been used in Oregon to gauge public opinion. In his presentation on Oregon´s Land Use Planning Program, Jonathan Raab, of the Bureau of Governmental Research and Service, pointed out that since the land use program inception there have been five major attempts to rescind or weaken the program. In 1973, insufficient signatures were obtained for a weakening ballot measure. In 1976, 1978 and in 1982 (during a recession), the system was supported in ballot measures by 57 to 43, 61 to 39, and 55 to 45 percent votes. Most recently and significantly, in 1984, an attempt to place the issue on the election ballot failed for lack of signatures. Although these ballot measures were designed to weaken or eliminate the system, state decision-makers were given the clear message of overall citizen support.

In his commentary on Oregon´s Land Use Planning Program, Dan Goldrich indicated how a strong citizen participation program contributed to this long term public support for the land use program:

> I think the value base of the discussion in Oregon was very important in sustaining land use planning which is still, obviously, very

controversial. The process that the citizens of the state went through early on in setting the goals was really comprehensive--it was not pro forma. The belief in that and the practice of involving as many citizens as possible in the formulation of the goals was very important in developing deep support even in times of conflict or controversy. It may have saved land use planning in Oregon but there is no way of testing that.

C. The Citizen Legislature, Citizen Commissions and Citizen Watchdog Organizations: Citizen participation in the Oregon Legislature (which meets every other year), citizen advisory commissions that oversee state agency operations and citizen watchdog organizations (e.g. 1000 Friends of Oregon, Oregon Environmental Council, etc.) were also mentioned by several of the speakers in promoting the passage of the bottle bill, land use planning, the Northwest Regional Power Plan and pesticide reforms.

D. Inspired Leadership: Several Oregon politicians were instrumental in promoting and fostering a political climate for innovation. Beginning the early 1900s with Governor Oswald West's efforts to preserve beachfront property for public use, through the populist republican governor Tom McCall, Oregon has enjoyed a long history of visionary leadership: democrat, republican, conservative or progressive. Governor McCall's impact at the height of the environmental activities of the early 1970s spilled beyond the Oregon border to gain national notoriety. Governor McCall was a colorful individual with considerable presence and a penchant to coin a memorable phrase. In his 1971 Oregon Legislature opening address, Governor McCall, referring to the need for the bottle bill, stated that "we should put a price on the head of every beverage can and bottle sold in Oregon." With reference to compromises engendered in passage of the Oregon Land Use Plan: "sometimes one must allow 10% of schlock to be built in order to prevent the other 90%."

Conclusion

Environmental preservation, at least in the Northwest, apparently has a strong foundation in tradition, democracy, and pragmatic conservation. It is important to note that few of the innovators attached a particular significance to the role of the

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sciences in the management innovations. Few would argue that a solid scientific background is necessary for an active and informed public, but law, history, politics, economics and ethics are also important for the development of management innovations--a reaffirmation of an interdisciplinary approach to environmental education.

Dr. John Opie, an environmental historian, summarized the findings of the symposium as follows:

> The environmental innovations in the Pacific Northwest have many physical and socioeconomic sources, causes and consequences. Yet many represent personal and collective struggle, growth, progress and development. Many of the environmental innovations are major achievements and can serve as national and international models. The Pacific Northwest is a leader in these innovations, but the rest of the U.S. and world may never follow--it may not be a bellwether for the rest of us--but they represent high levels of human achievement.

"ENVIRONMENTAL RESEARCH PROGRAMS FOR HIGH SCHOOL STUDENTS"

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During the three summers of 1985-87, over 1,700 high school students participated in a research-based program operated on six different campuses of the University of North Carolina System. Many of these students conducted research on environmental topics. This special program known as Summer Ventures in Science and Mathematics provides enrichment opportunities in science and mathematics for academically-talented high school students. The program brings rising juniors and seniors together in residential settings for five weeks of intensive study.

The curriculum at Western Carolina University in Summer Ventures, supplements rather than duplicates high school and university courses. The curriculum is designed to give students experience in scientific inquiry and mathematical problem solving. In the core, students learn about experimental design, laboratory skills, instrumentation, mathematical modeling, strategies in mathematical problem solving, and exploratory data analysis. The students learn these basics while studying specific scientific and mathematical topics, to which they are assigned on the basis of interest. In addition, all Summer Ventures students learn about computer applications, careers in science and mathematics, social issues related to science, and communication skills for mathematics and science competitions.

The primary requirement of the Summer Ventures students at Western is that each student must have been accepted by the faculty, formulate a viable research project and conduct the proposed research within the five-week period. During the last week of the program, students present their research in their respective groups. Then, each instructional group selects two projects for presentation to the entire faculty and student body of Summer Ventures.

The primary faculty are university professors from the respective sites and master high school teachers from across the state. Science and mathematics professionals from other institutions, government, and industry also may be involved in various roles.

Five separate research/instructional teams with no more than 23 students assigned to a team conduct research related to many environmental topics. The faculty for each team consists of university scientists, a university mathematician, a high school science teacher, a high school mathematics teacher, and a graduate assistant. The scientists and mathematicians present in the laboratory or field work, work as a team integrating the science and mathematics. Few lectures are given; however, when information or understandings common to the needs of the entire group are needed, lecture-discussions are conducted. Topics are addressed as the need arises through student investigations.

Students are in the laboratory or field from 8:30am until approximately 4:30pm Monday through Friday. Saturdays are devoted to academic field trips and picnics. Sundays are reserved as a time for fun and relaxation with Sunday evenings given to forums addressing topics suggested by the students.

Visiting scholars are scheduled to share their research with the faculty and students on Wednesday afternoon. For example, Dr. Gerald O. Barney, study director of The Global 2000 Report to the President was one of the visiting scholars.

Saturday field trips take students to research related centers such as The Highland Biological Research Station where scholars from a variety of disciplines study the flora and fauna of the Southern Appalachians. Also, research regarding development in the region is of much interest to the students of Summer Ventures.

The topics of student-selected research efforts range from mathematical modeling to the biochemistry of environmental effects on lung tissue to variables which impart on stream flow. Both written and oral reports of their work is required, and reporting by students takes on a format similar to that of a science or mathematical society's conference.

The residential life program offers a variety of evening and weekend activities ranging from opera and theatre to white water rafting and rock climbing. From this variety of opportunities, students are required to make selections and participate. The residential life counselors are undergraduate or graduate science or mathematics majors who have served as residential life counselors for regular university students during the academic year.

Summer Ventures in Science & Mathematics is limited to rising high school juniors and seniors whose parents or legal guardians are living in North Carolina. Students are selected on the basis of such factors as academic ability, interest in science and mathematics, and emotional maturity. This program is an investment by North Carolina citizens in the future of the state. All room, board, and tuition are provided free of charge.

As a follow-up to the summer program, Summer Ventures university faculty visit in the high schools of former students or teachers of the program. Such visits may involve a special lecture. demonstration and loan of a laboratory instrument, or assisting students in their research projects.

One significant indicator of student success and satisfaction with the program was that 100% of the students stated that they would highly recommend the program to other very capable students. All students demonstrated significant gains in such areas as designing experiments, using laboratory apparatus, designing mathematical models, doing critical reviews of technical papers, publishing research papers, etc.

The most important finding by both faculty and students was that some high school students can conduct viable research on significant topics to a much higher level of sophistication than predicted by either faculty or students.

Summer Ventures is a continuing program of the statewide University of North Carolina System.

MEETING THE CHALLENGE OF E.E. IN A NATURAL SETTING WITHIN THE CITY

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Providing environmental education programs to urban populations through a collective enterprise are key elements of Centre de la montagne park in Montreal, Quebec and the focus of this paper.

The number of people living in large cities is staggering and urbanization is increasing. Large sections of this population don´t flock to traditional environmental education settings. Using urban parks as a setting to reach this audience is first discussed with emphasis on attributes of program effectiveness. The second part deals with implementation and maintenance of management practices that reflect an essential component of our social paradigm; democracy.

Background: The City, the Site, the Users

The greater Montreal area has a population of 2.2 million inhabitants which represents more than one third of Quebec´s population. Mount-Royal Park, the largest park of the city, is conserved mostly in a natural state near downtown Montreal. This elevated point offering vistas of the city also acts as an attraction. In fact, two recent phone surveys showed that 40 to 50% of the population had been to the park in the last year. Here then is a site where large numbers of the population can be reached.

However, recent field studies showed that 90% of the users were there primarily to relax, mostly by walking. Few come explicitly for an educational experience. This has some important implications on how to approach the audience of uninitiated and casual park visitors.

Activities for the Users

Since 1981, we have provided educational programs for park users, primary school children and their teachers. We help them get acquainted with the environment, its relationship to the city, and also to the impact of their actions on it. Programs for park users include an annual exhibition (5 months/year), special events, mobile animation units that travel throughout the park and the publication of a guide map and self-guided trail booklet.

Reflecting on our experience, we have identified six attributes of program effectiveness to reach urban park strollers:

1. Appeal to curiosity: Enlarged or reduced scale models, large printed questions, reference to social myths (Is mount Royal a volcano?), and disclosure of unknown aspects of daily life (Water: from the mountain to your tap), all seem to be effective.

2. Links to daily life (what is at hand, or current events): These traditional facts of education are too often overlooked. In 1987, the most promoted exhibition in Montreal was: "Leonardo da Vinci, engineer and architect." We organized our own event: "Animals, engineers and architects."

3. Solicit active participation: We learn by doing. Audiences should be involved through hands-on activities, even in programs where educators are not necessarily present, such as exhibitions.

4. Use of humor: Park users are in a leisure situation. A humorous feeling is necessary in the attitude of educators, their messages and the way they convey them. There are amusing ways of getting a serious message through.

5. Aim at the uninitiated: However complex the content may be, it has to be simplified and popularized without losing its validity.

6. Prepare for rapid contacts: Park users are enjoying a walk; the information has to be presented in a short time period.

This is neither a priority list nor an exhaustive one. It only points to effective attributes, keeping in mind that they don't work in isolation but rather reinforce one another. Building upon these attributes, our programs have moved from nature interpretation to broader environmental considerations. Nonetheless, we still put emphasis on nature as shown by our exhibition's paradoxical title: "Your urban nature."

In the end, it all boils down to environmental and site knowledge, plus sensitivity to people and the learning processes. Research and information in these four fields are extremely useful, more so if they are combined with critiques and evaluations of others' and one's own programs. Payoffs can be varied; for one, we were able to double the average time spent by visitors at our exhibition while using the same amount of space.

The Organization

Centre de la montagne operates on an annual budget of $175,000 to $200,000 of which 85% comes from grants for education or free programs for the public. Thirteen different programs are offered, requiring 12 persons on an annual basis including a coordinator, a public relations person, a financial manager, a person responsible for a documentation center, an artist, persons responsible for audiences, and educators.

General characteristics of the organization are: emphasis on teamwork, voluntary work done by the staff, a critical attitude toward management and programs sustained by feedback of co-workers and a desire to have a democratic workplace.

Workplace democracy

Building an organization that has management practices congruent with our society's ideals of equity, justice, freedom and democracy seems desirable when considering our cultural heritage and our rather liberal formations (Nightingale, 1982). However, the building blocks of collective enterprise are too often charisma and self sacrifice. Although these may be good in the beginning phases, enterprise integration must be built on accepted differentiation of individuals and groups, not on conflict avoidance (Lawrence and Lorsch, 1962). In collective enterprise, this should mean that differentiated (specialized) individuals or groups would integrate (coordinate) their efforts through a negotiation process (Bhere and Tixier, 1981).

For Centre de la montagne, it meant that democracy had to permeate the four functions of management: planning, organization, direction and control. The following examples will illustrate how we have worked it out.

Planning starts with the annual assessment, which is a three-day retreat where all staff participate in the evaluation of the past year´s operations. Recommendations flowing from the assessment are the basis of the annual planning where general objectives, unit objectives, action steps and personal agendas are negotiated and formulated on standard forms. Unit plans and personal agendas are revised on a trimester basis. Finally, every month, a half-day meeting enables us to dispatch the unplanned and coordinate our efforts by distributing routine tasks or scheduling a bee. (see Figure 1) This whole process aims at integrating our efforts, while allowing for unit differentiation.

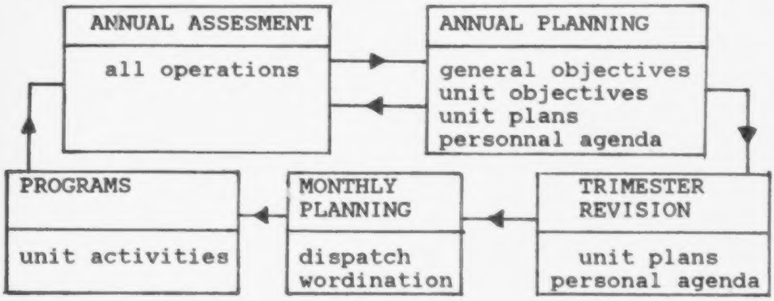
ANNUAL ASSESMENT
all operations
ANNUAL PLANNING
general objectives
unit objectives
unit plans
personnal agenda
PROGRAMS
unit activities
MONTHLY PLANNING
dispatch
wordination
TRIMESTER REVISION
unit plans
personal agenda

Figure 1: The planning cycle

Organization is centered on functions and audience units, represented on an executive committee that reports both to the board and the staff assembly. The executive committee acts as director.

Direction and control flow from the planning process and organization. They are carried out by the executive committee, the staff assembly and those responsible for units. Adjustments are made at monthly planning meetings. Meeting agendas appear on the billboard where anyone can add an item and the minutes are put in the logbook that is read and signed by everyone. This aids in keeping everyone in touch with all aspects of park operations and assist in building an institutional memory.

Staff evaluation, an important component of direction and control, is shared. We all evaluate each other with respect to our specific jobs. Getting feedback from 12 co-workers gives an image that better reflects reality than obtaining it from a single source.

The whole purpose behind these management practices is negotiating individual goals to achieve common ones. These are some of the democratic approaches that can be used to resolve the constraints that are borne in the juxtaposition of the logic between "the actors and the system" (Crozier and Friedberg, 1977).

Future Issues

Reflection on education and management practices should remain important for Centre de la montagne. They are essential aspects of programming quality and organization.

In the field of education, Mullins (1984) has identified many issues that environmental interpreters will have to address in the future. More specifically, at the level of philosophy and program content, some reflections and changes might be in order. Those individuals who can look back at the early environmental movement (see Devall, 1984; Evernden, 1986; Livingston, 1981; Sessions 1983) could provide use with valuable hindsight.

Another more immediate concern is management, not so much at democratic practices (which will nonetheless remain important), but funding. How will private organizations manage to finance free educational programs to the uninitiated and casual park visitors? Environmental education, being a life-long process for all ages and educational levels, requires free programs for some audiences.

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THE IMPACT OF FIELD EXPERIENCE ON STUDENTS

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For the past five years International Student Research, Inc. (ISR) has provided extended field experiences for students interested in ecosystem research and conservation. For example, programs have included monitoring a population of beavers in a National Forest, documenting the rate of erosion and sedimentation in a salt marsh, and aiding scientists at the Charles Darwin Research Station in the Galapagos to study endangered and endemic animals. Did these experiences have any effect on the environmental knowledge and awareness of the students? Was this translated into further action, either in choice of career path or daily conservation-minded behaviors?

With these thoughts in mind, a questionnaire was developed and given to all participants in BIOQUEST EXPEDITIONS (field experiences lasting more than one week). In addition, questionnaires were given to public and private school students who had either no field experience, or only one or two day class related field experiences. We recognized the inherent difficulty in discerning between response to a questionnaire and measurable behaviors, but felt that the answers would still serve as a valid indicator of the impact field experiences have on students. The original idea was to compare the responses of each group, but due to the small sample size, the data that follow are more cumulative than comparative.

The questionnaire was designed to document the following:

1. the teaching methodologies students preferred;
2. what influences affected student´s career choices;
3. the amount of time students spend outdoors;
4. students´ concern for global/local conservation issues;

5. students factual knowledge about those issues;

6. how students perceived their role in environmental problems; and

7. their conservation behaviors.

The format included twelve forced choice questions and five open ended questions.

The average age of the 162 participants surveyed was 14. Twelve percent of these had no field experience. Thirty eight percent had limited field experience and fifty percent had field experiences lasting from one to four weeks. The following is a summary of key findings of this study.

1. Favorite Science Topics: animal behavior, oceanography.

   Preferred Teaching Methods: 1st choice: observing a pond (except those with no field experience who preferred classroom experiments); 2nd choice: audio-visual presentation; 3rd choice: classroom experiments. Least Preferred Method: class lecture.

2. Career Interests: 20% natural sciences, 6% other sciences. Three primary influences were: It would be fun--72%; I´m good at it--55%; It would help other people--48%.

3. Hours Spent Outdoors: average of 41 hours per month.

4&5. Environmental Attitudes: Greatest concerns were:
   a. Atmospheric destruction
   b. Species extinction
   c. Nuclear war
   d. Destruction of tropical rainforests

6&7. Conservation Behaviors (students felt they exhibited):
   Turn off lights 40%
   Pick up litter 26%
   Conserve water 24%

A four week trip taken by the authors and a group of high school students to the Galapagos and Amazon Basin in the summer of 1987 illustrates the special kind of learning offered by field experiences. One purpose of the trip was to enable the students to appreciate fragile ecosystems. At the end, the students described their reactions:

> I learned to appreciate the beauty and value of the Galapagos islands. I have developed a protective concern for such fragile, amazing ecosystems.
>
> I was better able to see and understand the human interests and conflicts involved, saw more examples, and became even more convinced how fragile the areas were and how important conservation is.

In addition to learning about the ecosystems, students expressed feeling tremendous growth. Their sense of self worth was enhanced by the experience of competence. The students were proud of collecting and analyzing data themselves. They developed a personal sense of responsibility for each other and in a larger sense, for protecting the island and the rainforest from destruction.

In this study, field experience is defined as any opportunity for students to observe actively and document their findings outside a classroom or nature center. This could include a behavioral study of pigeons, and urban vegetative assessment, or a full scale look at a fragile ecosystem in a wilderness area. By capitalizing on expressed desires (fewer lectures, a chance to make a contribution, enjoyment of the outdoors, etc.) field experiences are a sure way to provide students with real problems/projects, a forum for exploring several solutions and a chance to increase self esteem. That so many students aspire to scientific careers because they enjoy and are good at science suggests that field experiences offering students the chance to demonstrate competence may be the optimal approach to encourage such career interests. Knowing that they reap the rewards or suffer the consequences for mistakes, gives students the chance to experience autonomy and decision making.

In responding to environmental policy problems presented in a personal way, most students responded that they had not previously seen how their families actions were contributing to ozone depletion or rainforest destruction, and that they would change their behaviors now that they saw a connection. Thus another key aspect enhancing individual concern for the environment is to empower that individual so that they realize how their actions can influence, and possibly change a situation.

Thus the results of this survey support the findings of others (Hines et. al., 1987), who found that an individual knowledgeable and concerned about a problem is more likely to be action oriented in solving that problem. These trends provide insight into ways to enhance environmental education programs in schools and other settings.

How can this information be incorporated by teachers or naturalists into their own program? It is apparent that lectures should become secondary to actual experience. A dream? Perhaps, but it is certainly feasible for students to observe the natural world as it exists in their own backyard or school. Asking questions and developing a method to answer them is an integral part of scientific discovery, something all schools profess to teach. The following outline illustrates a few elements that should be considered when integrating field experiences into a pre-existing program.

The teacher or naturalist should spend some time devising what questions to ask. Where does our water come from? Why are there certain species of plants consistently found in urban areas? What limiting factors govern a local population of squirrels, pigeons, raccoons, etc.? What effects will a new sub-development have on the watershed, flora, and fauna? Each community has numerous opportunities for discovering why things work as they do. The first step is to engage student interest and provide enough background information to get them started.

Next, allow the students to actively investigate the question in the field. Get them outside to see for themselves. After they have had a chance to develop their own ideas, then provide advice and direction. This should include a forum for devising strategies to solve a problem or explore a question. Community involvement can include anything from collecting data from local sewage treatment plants to talking with local politicians and business people.

If students are encouraged to initiate an active dialogue that allows for the presentation of various opinions, they will internalize a feeling of autonomy, feel proud of their contribution, expand their sense of responsibility, and learn how to effect change within a system. When a student can say "I did this, it had these consequences, and my experience is related to larger environmental concerns in this way," he or she has been taught not only science and responsibility, but has experienced personal growth.

An important point to remember is to integrate student efforts into a larger activity. They need to know how their efforts contribute to a research project. This can be accomplished by encouraging students to examine not only the current status of a project, but what happened before it started and what changes the future may hold. Given the lack of funding for environmental monitoring, students can potentially fill a need by providing basic data for scientists and their communities.

To summarize, this study reaffirmed findings indicating that individuals who are able to identify a problem, devise active solutions, and feel a sense of responsibility are more likely to exhibit conservation behavior. Field experiences provide a vehicle for personal growth, that is, one's action can have an effect, and increasing knowledge of scientific methods. Field experiences are the best way to give students a chance to develop a sense of self in relation to, not separate from, the natural world. Perhaps they will then discover for themselves what Aldo Leopold expressed so succinctly, "Pluck a petal from a flower and you disturb a star."

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PURSUING A NEW RELATIONSHIP WITH NATURE THROUGH EDUCATION AND LEARNING

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From earliest times humankind has taken nature for granted, simply treating the Earth as an inexhaustible warehouse of materials for human use. However, generations of overuse and neglect have left some very serious problems, and raised grave concerns about too many people, overusing limited resources and producing vast quantities of waste. In some parts of the world, famine, poverty and disease already are growing worse because of rapid population growth and the shortage of critical supplies. Yet while the environmental crisis deepens and the debate becomes more polarized, our society seems ill-prepared to address the difficult issues confronting us. Moreover, our continued reliance on selfish, short-sighted and outdated concepts blinds us to the reality of deteriorating environmental quality, and our misplaced emphasis on rationalization and confrontation are jeopardizing the prospects for a safe and sustainable future.

Although a prosperous and secure future still may be possible, more and more people realize that it is unlikely unless we are prepared to make some fundamental changes, and to recognize that the Earth cannot indefinitely support our growing demand for space and resources. The level of concern may vary but there is growing anxiety, even alarm, that our failure to see the Earth as uniquely life-maintaining threatens us with social and environmental disaster.

Our society is confronted by some pressing decisions concerning our relation to nature. Acid rain, the accelerating extinction of wildlife species, diminishing air and water quality, the loss of vital forest and farm land, vanishing wilderness and the proliferation of toxic substances are some of the fruits of our indifference. We are truly entering a new era of human existence.

There are those who argue it already is too late, that we lack the will and courage to develop a new relationship with nature, and to understand humankind as part of a dynamic and vital system where each part, human and non-human alike, is intricately woven into a single living entity.

Gratefully, a growing number of contemporary thinkers remain hopeful and are searching for alternatives based on an ethical tradition that makes human relationships to the natural and non-human world a matter of moral concern.

Change is coming whether we like it or not. So much better if it comes as a result of choice rather than environmental disaster or social upheaval borne of short sightedness and self-interested behavior. But we must realize that orderly change requires that we address the issues with necessary thoughtfulness and haste.

The natural and non-human world cannot continue to sustain unmitigated pressure without risk to the global ecosystem and the richness and diversity of life. Thus, we must commit ourselves to the development of a more rational and sustainable relationship between environment and development, and greater appreciation and respect for nature.

However, this transformation will not come without a concerted effort. It will take courage and foresight, and it will require an informed citizenry and a new breed of professionals who can, and will, develop an enlightened set of principles and priorities. We also must develop deeper commitment and greater awareness amongst individuals, industries, organizations and governments for the need to work together and to put aside past differences. It won´t be easy and it will require leadership, but it is our obligation to ourselves, our children and generations yet to come.

The question is how to develop the understanding and concern necessary to recognize that we each bear a share of responsibility for the natural world and for the future. Education and learning are vital components of this process. Real progress requires a fundamental change in human goals and values. In the past we relied far too heavily on the "react and fix" approach. Although it led to some progress, given future trends, these measures would seem to be inadequate unless they are strongly reinforced by preventative programs. Thus, we must be prepared to reexamine the assumptions and goals which predispose us to certain choices, and where necessary, to change our demands and our lifestyles.

In the words of the World Commission on Environment and Development, "progress on the issues of environment and development depends, perhaps more than in any other field, on the support of an informed public opinion and that, in turn, depends on open forms of examination and assessment, and on the free flow of resulting information." It is precisely to this end that the Harmony Foundation of Canada is pursuing the establishment of a comprehensive education program in environmental ethics. The proposal includes three major components: 1) the establishment of an endowed chair in environmental ethics; 2) the organization of a broadly-based program of continuing education for public and professional participants; and 3) the development of education programs and materials for schools.

The endowed chair can help to give focus and objectivity to scholarship in this rapidly emerging field of interest, and guidance and advice to the public education programs and professional forums. Necessarily, it will engage a wide range of specialists in an interdisciplinary examination of environmental concerns. Emphasis will be placed on the consideration of innovative new approaches.

The public and professional education component will be convened through a non-profit Learning and Resource Centre. It will create opportunities to bring together a wide spectrum of interests to address current issues, exchange views and share problem-solving techniques in a rational and non-confrontational environment. The Learning and Resource Centre will provide an important bridge between academic and public endeavors. The Centre also will maintain a collection of resource materials. A distinguished group of individuals will serve in an advisory capacity.

Another major emphasis will be to develop school programs and materials to help students effectively examine the social and environmental implications of living in technological society. Past practices have diminished the quality of the environment that future generations will inherit, and it is our responsibility to prepare them to deal with the problems and decisions which will confront them. The school programs will be developed and presented in cooperation with the Ministry of Education and local school boards.

The program has received strong expressions of support, because of its comprehensive and long-term approach. It has been endorsed as an innovative and necessary attempt to increase public involvement and to emphasize education and cooperation in addressing environmental issues.

The program is timely and urgently needed. Education must now become an integral and priority part of our efforts to ensure a safe and sustainable future. The program is gaining momentum. The list of endorsements and supporters is growing. Robert Bateman, noted artist and naturalist, serves as Honorary Chairman. With the assistance and support of many concerned individuals and organizations we can help 1) raise the level of understanding and enhance cooperation; 2) develop innovative, substantive and realistic programs of action; and 3) ensure a safe and sustainable future.

The challenge to our generation is to find ways to greatly improve our ability to anticipate and prevent environmental problems, and to effectively judge the long-term implications of our decisions. To succeed, we must learn to work together, and to live as if nature mattered.

A STEP IN AN ENVIRONMENTAL EDUCATION PROGRAM FOR AN AGRICULTURE MILIEU: A SURVEY OF PERCEPTION AND ATTITUDES OF AGRICULTURAL PRODUCERS IN QUEBEC

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ABSTRACT

In order to develop an environmental education program for Quebec farmers, the first step undertaken was a survey of their perception, attitudes and behavior with regards to the environment. At this stage, the Educational Service of the Department of Environment responsible for the program obtained the involvement of the Provincial Department of Agriculture and the Farmers Union of Quebec.

A postal survey of 846 farmers had a response rate of 65% which attests to their interest in environmental questions. The targeted statistical population was stratified according to types of production and regions. Responses were submitted to multivariate analysis (factorial and discriminant). Results reveal that agricultural producers are most sensitive to the problems of water pollution by pesticides, followed by chemical fertilizers, then manure and finally erosion. Agricultural atmospheric pollution is considered by farmers to be of little importance while soil pollution is given an intermediate position.

The effect of production type and region in response variation will be presented in greater detail. These findings suggest that educational strategies should be adapted to the different situations.

UNE ETAPE DANS UN PROGRAMME D'EDUCATION A L'ENVIRONNEMENT EN MILIEU AGRICOLE: ENQUETE SUR LA PERCEPTION ET LES ATTITUDES DES PRODUCTEURS AGRICOLES DU QUEBEC

Cette etude (Boudier 1983) a ete menee a l'interieur du Service de l'education du ministere de l'Environnement du Quebec. Elle visait a connaitre comment les producteurs agricoles percoivent la realite environnementale, quelles sont leurs

attitudes face a l'environnement, afin de permettre l'elaboration d'une strategie d'intervention educative dans ce milieu, strategie qui devait se faire en collaboration avec les differents intervenants du milieu agricole (Ministere de l'Agriculture, des Pecheries et de l'alimentation du Quebec, l'Union des Producteurs Agricoles).

La phase exploiratoire nous a permis, a l'aide d'entrevues, de cerner le cadre de reference de cette realite environnementale tant pour les intervenants que pour les producteurs.

L'environnement a ete aborde sous les themes de la pollution et des nuisances. Trois composantes sur lesquelles les pratiques agricoles ont des consequences ont ete retenues: l'eau, l'air et le sol. Parmi les sources de pollution, ont ete identifies: les pesticides, les engrais chimiques, le fumier et l'erosion.

Un questionnaire, compose de questions ouvertes et fermees a ete expedie a 846 producteurs agricoles selectionnes aleatoirement parmi les 49 789 producteurs agricoles du Quebec. L'echantillon fut stratifie par region et par production. 65% des producteurs ont repondu.

Des resultats de l'enquete se degagent des pistes permettant d'orienter l'elaboration d'un programme de sensibilisation et d'education a l'environnement aupres des agriculteurs.

Il ressort que dans la conjoncture economique actuelle, les producteurs agricoles sont tres sensibles aux couts engendres par le controle de la pollution. Ils se sentent les boucs emissaires auxquels les citadins et les fonctionnaires imposent la facture du controle de la pollution.

En matiere d'intervention educative, le sondage nous indique que les attitudes des agriculteurs peuvent permettre un consensus plutôt qu'une confrontation sur les problemes du controle environnemental. Pour cela, la solution est de rechercher des moyens qui sont percus comme n'entravant pas la production tout en favorisant l'assainissement. Les attitudes par rapport aux fumiers, aux pesticides, aux engrais chimiques et a l'erosion indiquent que les programmes les mieux recus seraient ceux qui vont au dela du controle en proposant des alternatives.

Si les agriculteurs sont d'accord avec l'intervention d'Environnement Quebec pour protéger l'environnement, ils pensent qu'ils devraient être appuyes financièrement. Un programme d'éducation combine a un programme de contrôle de la pollution alliant des pratiques de production alternatives et accompagne de mésures d'aide financière formeraient un ensemble de composantes qui éviterait la confrontation et repondrait aux attentes des agriculteurs.

Les informations sur la perception de la pollution de l'eau, de l'air, du sol par les pesticides, par les engrais chimiques, par le fumier, par l'érosion nous montrent que c'est le problème de la pollution de l'eau par les pesticides qui touche le plus les agriculteurs. Les pesticides arrivent en tête comme source de la pollution de l'eau, viennent ensuite les engrais chimiques, puis le fumier et l'érosion. Quant à la pollution atmosphérique, ils sont peu sensibilisés et ont une position intermédiaire pour la pollution du sol. Ces résultats indiquent que l'on devrait élucider la question de la pollution de l'eau par les pesticides. Cela facilitérait le passage a la question de la pollution du sol, puis a celle de la pollution atmosphérique.

Les producteurs agricoles semblent ouverts a des pratiques agricoles qui respectent l'environnement. Ils utilisent deja des techniques préconisees par les agronomes du ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Quebec ainsi que ceux d'Environnement Quebec pour améliorer le sol, limiter l'emploi des pesticides, d'engrais azote et l'érosion. Il est donc important de partir de l'utilisation de ces pratiques pour faire le lien entre pratique agricole et environnement. En faisant ressortir les impacts positifs de ces techniques sur l'environnement, on facilite la compréhension des mécanismes par lesquels certaines autres pratiques ont un effet négatif. Cela permet de plus de banaliser, auprès du producteur, le changement vers d'autres techniques plus respectueuses de l'environnement, puisqu'il en utilise déjà certaines. Cette approche aurait l'avantage de ne pas developper que des points négatifs dans le programme de sensibilisation. En d'autres termes et de façon complementaire, il faudrait, a partir de cas concrets intégrer deux discours qui sont souvent présents en opposition, celui de la production et celui de la protection de l'environnement. Il s'agit de susciter une approche environnementale de la production.

La variance des attitudes des agriculteurs semble etre determinee par l'interaction de deux dimensions conjointes, le type de production et la region. Les strategies d'intervention devraient donc être décentralisees et diversifiées. Des rencontres directes regroupant des producteurs par localite et par production specialisé devraient être privilegiées. En effet, les agriculteurs se deplacent pour chercher l'information (conference, reunion, etc...). D'autre part dans leurs pratiques agricoles, leur experience ou celle des autres agriculteurs jouent un grand role.

Les plus jeunes et les plus scolarises ont tendance a être plus conscients des problèmes environnementaux. Donc il faudrait penser a creer des programmes d'education dans les ecoles secondaires et les colleges agricoles afin de sensibiliser la prochaine generation d'agriculteurs des le départ.

Bien que les femmes n'aient pas ete rejointes par le sondage, elles ont montre un vif intérêt pour les questions environnementales lors de la pre-enquête. Vu le role qu'elles jouent sur l'exploitation, elles devraient etre integrees dans les programmes d'education.

La campagne d'education fonctionnerait mieux si elle etait faite en cooperation avec le MAPAQ et l'UPA qui sont les sources privilegiees d'information pour les agriculteurs, plutôt que de facon isolee.

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EVALUATION OF THE IMPACT OF A DECENTRALIZED CAMPING EXPERIENCE ON THE DEVELOPMENT OF 5TH GRADE CHILDREN

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Our decentralized camping experience with 5th grade children is interesting to analyze because of its global approach to environmental education and its effectiveness in reaching its stated educational goals. The movie "Imaginez ce qu'un enfant..." describes the experience.

In June 1981, a group of 25 fifth graders from Montagnac school in La Beauport near Quebec city went to Trail Blazer Camp in New Jersey, U.S.A. for 10 days. The program is based on Lloyd B. Sharp's philosophy of decentralized camping. The concept of decentralization applies to both location and authority. Essentially, the children lived in small groups of 10 to 12 (including two adults, present 24 hours a day) in separate locations in the forest. Each group was responsible for making daily decisions about their camp life.

The three major aspects of the experience were: a primitive lifestyle close to nature, small group autonomy, and real life situations. Daily life was shaped by the requirements of living in the woods under canvas shelters: cooking complete and balanced meals over a fire, maintaining the small camp conveniences, washing clothes etc. Each small group was responsible for planning its activities, within the limits of health, hygiene and security (hours of sleep, mealtimes, daily siesta after lunch, daily shower, etc.) The groups also planned their menus for the meals they cooked outdoors (one or two meals a day). In the end, no two groups had a similar experience. Many different activities were accomplished: donkey riding, earth walks, new games, gardening, hiking, birdwatching, swimming, rowboating, creative writing, crafts, etc.

Planning such a camping experience requires a technique which allows for the unpredictable and non-formal nature of different situations while ensuring that the educational objectives are achieved. Our planning included every aspect of the outdoor experience that could influence a child's development: from types of activities to possible counselor interventions, daily routines and physical setup.

First, we established what we wanted to achieve: a sense of conservation, an ability to cooperate and a balanced personality. Those three main intentions were subdivided into twelve sub-objectives. Then we listed under each sub-objective as many means as we could think of that could favor their attainment. Our task was to find means that had a causal relation to the different objectives. There were four categories of means: pedagogical methods; daily life; activities; and human feelings, financial and material resources. Among the means, some were not dependent on the children's choices and others were.

These subdivisions were a good way of reaching agreement and an excellent tool for evaluation. During the experience, we gathered data through participant observation and collecting each group's camp program plans. After the experience, the kids and the parents completed a qualitative evaluation form. With this information, we were able to assess the means that were actually used for each sub-objective. We also could describe the results obtained in regard to every sub-objective by relating our different data to the children's development.

The main conclusions of our research are the following:

-Because of the camp's primitive life situation, the children developed good attitudes and abilities toward the natural environment. By living constantly in the forest and using natural resources to satisfy their needs, the children overcame their fears, sharpened their sensory perceptions, heightened their sense of wonder and improved their techniques for using natural materials. The children's improvement in knowledge of their natural surroundings was, however, less obvious.

-We encouraged significant progress toward solidarity and respect of democratic life among every team by: giving control over program planning to each small group; using democratic leadership; emphasizing constantly the necessity of mutual respect; and searching for maximum participation of every child in the planning process.

- Daily routines contributed to the development of good health, hygiene and security habits.

- The children were more autonomous, resourceful and responsible as a result of the experience.

- For a rich educational experience, it is important to start planning such an experience by choosing appropriate pedagogical methods and defining a daily-life plan.

- It is also important that the natural environment be used as a living place and not only as a playground.

- Small group relationships must have priority. They provide each individual with the security, solidarity and the dynamism necessary for his/her development.

- The impact of such an experience on the children's development is proportional to the time spent in the situation. Ten days appears to be a minimum.

MAKING ENVIRONMENTAL EDUCATION FUN

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The "dozen proven ways" described have been utilized in K-12 in Southwestern Indiana to bring fun to learning environmental concepts and values. Included are emphases upon local, familiar, and historical actions, as well as vocabulary development. Products include a creative video, a robot, energy consumption research, advertising, and visible rewards. The underlying assumption is that serious problems are often best approached through teacher humor.

A Dozen Proven Ways

1. Familiar local scenes are included. E.g., Terre Haute, Indiana, has a duck crossing near its main park. It also has "birds" at the airport that provide jobs as well as controversial noises. Photographs of these scenes lead to lively discussions about environmental issues.

2. The historical context of environmental jokes, stories, and songs is considered. E.g., "Stainless Steel Palm Trees" (Crider, 1978).

3. Environmental vocabulary is developed through games. E.g., Steve Jackson's crossword puzzle for (teachers and) pupils takes terms from the Journal of Environmental Education (Buethe, 1987) and combines them into crossword games via Apple IIe.

4. Outdoor activities are used. "Gus" Costello's Terre Haute South High students are quietly active when learning in their outdoor lab. Ms. Costello gets her students to think like birds while designing nests, wears her bird-brain pin; she adapts Project WILD and Learning Tree materials for fun/learning.

5. Local news items are used to further capitalize upon the familiar, revealing some of the complex multiple impacts of

environmental issues. E.g., the mayor, and ex-teacher, is pleased to tell his side of the story of the EPA lawsuit against the city (Terre Haute Tribune, 1987).

6. Creative expressions of both students and teachers are used. E.g., cartoons, poems, songs, puppets, plays, games, symbols. One high school recycled aluminum cans into school symbols that were used as awards.

7. Special tools are made. E.g., Jerry Mansfield and Jerry Brown's "MEL", the robot, broadcast environmental messages. MEL, whose name stands for Multiplied Environmental Literacy, was interviewed on television and served as guest weather science expert.

8. Wooded space near a school is utilized. Teachers Nancy Hile and Sam Ligget asserted themselves, planned with students, educators, and others, got funds, and developed a district outdoor center at Honey Creek Junior High Scool in Vigo County, Indiana. The model site includes a classroom in the woods.

9. Environmental "goodness" is advertised. E.g., school posters display photographs of students doing marvelous EE things. A teacher whose colleagues judged her energy-saving idea the best received a special school T-shirt labeled "Captain Thermal."

10. Street interviews are conducted about the origin of some foul odors in the city. Polls are taken about the annual leaf burning flap. The response of the electric power company to a student letter about acid rain is anticipated. The local Congressman's annual survey of voter opinions is reviewed. A parent who works for a coal company joins the dialogue. An environmental activist responds. Fingers of blame are pointed. Political fun!

11. Research is done. E.g., it is learned that more than $3,000 per year could be saved by Indiana State University in the Education building if the staff turned off lights in unoccupied rooms after 4:00pm each day.

12. Positive environmental action is rewarded. E.g., warm fuzzies, buttons, and certificates are a start. But nothing beats a warm smile, an encouraging word, and a letter on school stationery that is sent to an involved student's home. Making environmental education fun is important, and that means fun for both students and teachers. When more teachers see that EE goes beyond blaming others or taking Chicken Little views of life, environmental education is well served.

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EDUCATION WITH SOFTWARE

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Many educators become frustrated when commercial software does not cover their specific needs, is difficult to modify, or quickly becomes outdated.

As an educator, our job is to excite people to concepts, terminologies, and attitudes about ecological/environmental issues and facts. But, with few exceptions or in special projects, we use "conventional" means for a technologically entertained culture. Would it not be delightful if environmental education programs and nature centers used a Disneyland approach to information processing? This approach can operate on sound environmental principles, and excite, interest, and capture the mind, heart and soul of its audience or students.

--Why can't students ride a space capsule to learn astronomy, to supplement the viewing of distant stars in the darkness of night;

--Why can't individuals spend a day in simulated fox dens instead of reading on a board the various activities of foxes; and

--Why can't individuals actively control their speed of processing or reflecting on information by interacting with appropriate software? This surpasses watching a film, where the passive learner has little control to stop, review, or slow the rate of information.

Yes, I believe this is environmental education of the future--but we must begin now to revamp some of our routine methods for communicating information. As educators, we do digress from the conventional once in awhile--but usually only for special projects, extra funded programs, or other identified task.

Very few educators are fortunate to have the equipment or ability to properly use automated instructional units with the microcomputer as an instructional tool. The bulk of our conventional educational techniques still include: class lecture or audio tapes, textbooks, pamphlets or display boards, guided nature hikes, narrated films/slides, testing techniques and electronic circuitry that "light up" the correct response.

Many of these techniques require individuals to be primarily passive in their learning, or require learning to occur at a set pace or specified time. The time or types of interaction are minimized. For example:

--Have you, as a parent, ever tried to hurriedly read exhibit text while your child is tugging at your side and asking "What is it?" or "What does it mean?"

--Or, how comfortable are you about returning to a previous exhibit to "review" or "refer to" some previous information when you are with a colleague at a new exhibit.

--Or, do you, as a learner in a guided education tour, feel comfortable asking the leader to spell the name of the wildflower and elaborate on its leaf structure, while the rest of the group wants to push ahead or the leader reminds the group of the time schedule.

Some adults dislike asking questions and prefer to keep searching; others ignore information or explanations rather than ask directions. But, if we're at an airport, hotel, or shopping plaza, we usually walk up to the automated information booth and seldom hesitate to push buttons for information--even if our justification is just to learn how the automation works. We all know children are certainly not shy about pushing buttons. Similar types of experiences occur in "experiential classrooms". Appropriately developed software can address these types of situations and make some learning easier, as well as being fun and using current technology.

Educators know learning can be increased if individuals actively participate, if the information presented is specific, if methods of presentations are varied and if the learning process is convenient and comfortable.

The software program we presented uses the microcomputer in a basic and inexpensive operation.

However, for individuals still uncomfortable with computers, it can easily be implemented by the user; quickly modified by the educator to a situation, location, or specific season; and simple to put together. It is important to note that we do not believe that all learning must use automated methods. To the contrary, we believe software is a supplement to enhancing learning. Where appropriate, it must be integrated into the instructional environment, not added as an awkward appendage.

Computer-assisted instruction can be in the forms of tutorial, drill and practice, problem-solving, and simulation. Today's application of the software is for drill and practice. It can readily be used to develop materials for various age groups, experiences, and interests. It can be used by many students, while minimizing the strain on personnel.

"Environmental Template"

The software program called "Environmental Template" is written in BASIC. To use the program as a drill and practice exercise, the educator must provide:

-a set of vocabulary terms to be learned;
-a brief description or explanation of these terms

The educator types the words and description at the designated place within the program. This is entered with line numbers. A manual which comes with the software program explains the process in a step by step format. You do not need to be a programmer to use "Environmental Template".

The program is a template because the actual program can be modified for almost any topic in environmental education that must deal with terminology and characteristics. Environmental educators can use the template to introduce or review concepts, introduce terms and attitudes toward local, national and global ecological concerns. Specific uses include:

--assisting people with learning the names and characteristics of plants, flowers, national parks, trees, animals and birds;

--reviewing concepts by using key terms

--providing a multiple choice testing format; and

--interfacing with other visual media like slides.

The example demonstrated focusses on some of Ohio's wild flowers. Ten flower names, along with key identifying characteristics are used. The ten flower names remain on the screen, while the user is presented a series of characteristics from which to select the correct flower name. If the response name is the correct flower name, a beep sounds and a new set of characteristics is presented. If the response is incorrect, then the correct flower name is flashed to the screen.

The program can be modified to accommodate all levels of learning, from elementary to adult. The user can prepare his or her own title screen and objectives to suit the material.

Conclusion

Many educators are using programs as basic or more complex than this one. This program was used to show its quick adaptability, user friendliness, and the integration of computers into environmental programming--not as an appendage that might relate to some aspects of teaching. This software is easily customized to meet your ever changing needs.

With appropriate automated systems, education departments can augment information to meet new demands, enhance the excitement of learning, and reflect the ever-changing faces of the outdoor environment while still serving individuals comfortably, conveniently and easily. In summary, the learning process must be multi-dimensional, combining conventional with automated information systems that are appropriate.

STAFF RESPONSE TO STRESS

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Literature Review

Resident camp staff suffering from physical, mental or emotional stress can be detrimental to staff unity and program effectiveness much the same as teacher burnout negatively impacts learning in the school environment. The presence of stress may manifest itself in several ways. Staff may try to isolate themselves from other staff or program participants; they may exhibit sudden irrational bursts of anger; or, they may adopt an insulting or unfriendly demeanor. Constant fatigue and unexplained illness may also be signs of high stress. When stress is foremost in the staff's life, it affects their relationship with each other, reduces their interest and concentration for the camp program, and hinders their effectiveness to assist campers in self-discoveries or excitement for camp activities.

These behaviors are counter to the positive characteristics generally exhibited by individuals who elect to be in resident camp settings. They tend to be sensitive to the environment and program participants. They promote group harmony and are interested in an individual's security and ability. Effective camp staff exhibit good teaching and communication skills. Further, they have a knowledge, appreciation and enthusiasm for the outdoor environment.

As with beginning teachers, camp staff exhibit a developmental progression of concerns which are induced by stress. The pre-camp phase is characterized by non-concern. During the beginning program phase, the concerns focus on self; while continuing into the program phase, the concerns are directed to participants and their educational development. (Coates & Thoresen, 1974).

Sources of anxiety for staff include concerns relating to:

- -maintaining discipline,
- -being liked by campers,
- -knowing program content,
- -correcting their errors in professional performance or providing adequate and timely material, and
- -relating personally to other staff, camp administration, and parents.

Observing staff anxiety and addressing methods for improving staff effectiveness is studied in several ways. Neppel (1964) reported that counselor behavior, reflecting anxiety during the first two days of camp changed to good feelings about self, children, and camp during the last three days of the program. The results further indicated that staff with previous leadership experience got along better with campers than those students who had no previous experience.

Resident staff training programs are implemented consistent with reducing factors of staff stress and improving their effectiveness. Their length and content varies. The results of research provide several factors for consideration in designing resident staff training programs. Ross (1971) suggests that resident training which provided knowledge of teaching methods assists staff in being more effective leaders. In discussing several obstacles to staff training, Rodney and Ford (1971) identify:

- -the time set aside for pre-camp training may be too short to accomplish everything desired;
- -the backgrounds of staff may vary greatly causing boredom with repetition for some, while others become enthusiastically involved; and
- -camp area may be unfamiliar to the staff.

During training programs, physical activity is altered with sessions of sitting and listening. Various training techniques are used to assure maximum attention and comprehension. Work sessions with staff performing specific tasks enhance their interaction and cooperation (Ball & Ball, 1971).

Experiential programs allow individuals to meaningfully learn rather than merely observe a demonstration or listen to a verbal description of an activity.

Methods of Study

This study is a follow-up to previous investigations identifying factors contributing to stress in resident camp staff (Shepard & Caruso, 1986). The purpose of this study was to design a training program which assists in preventing or alleviating stress factors for resident camp staff. The data collected from this study were compared to known stress-inducing situations and effective training methods as identified in the literature.

A training workshop was developed for the Florida 4-H summer camp staff. The program incorporated experiential (learn-by-doing) activities; direct program contact with campers; various teaching techniques; practice in leadership and group dynamic skills; and, examples of camp activities and pre-programmatic considerations.

The objective was to determine if any relationship existed between each of the stress level factors and program performance. During the training workshop, the presence of stress-level factors of anxiety, depression and hostility in camp staff was measured and monitored by using Multiple Affect Adjective Checklist (MAACL). The MAACL provides valid meanings for these three affective states and can be correlated with specific program activities (Zuckerman & Lubin, 1965).

To supplement the data from this paper and pencil instrument, demographic information was collected on each of the staff members. Additionally, the program facilitators maintained a log of conversations and comments of staff that might provide insight to stress situations.

Sixteen staff members participated in the week-long training program. These individuals would comprise the summer program staff at Florida's four 4-H camps. The group consisted of eight males and eight females.

The MAACL was given to staff members at the beginning of the training session to determine the presence of the stress factors--anxiety, hostility, and depression. This same instrument was administered five additional times during the training session. The administrations would establish whether change in stress had occurred and, if so, the direction and degree of change.

Conclusions and Recommendations

Analysis of the data indicates that there are identifiable times when stress factors seem more prevalent. There are also some techniques or administrative actions which can help reduce the effect of these stress-inducing periods.

There is an initial anxiety level which may be categorized as "stage fright". It is the period when uncertainty arises and is present even if the upcoming action has been performed many times before. Stress can be reduced by allowing sufficient time prior to the activity to plan and prepare. Beginning activities should be friendly, low-keyed, and non-threatening. Supervisors or facilitators can assist by providing encouragement and positive reinforcement.

Generally near the end of the second day of camp or the beginning of the third, stress levels increase dramatically. Staff begin to question their abilities, such as feeling inadequately prepared or perceiving concerns about their continued ability to properly discipline and instruct campers. Along with the initial "stage fright", these factors combine and cause increased tiredness.

It seems unrealistic to believe that an increase in stress can be eliminated. However, proper administrative action can alleviate stress levels and reduce or eliminate unwanted outward manifestations of stress.

Good planning, experiential training and solid preparation of activities can help staff feel better prepared. They are taught to realize that no one knows all the answers and part of the learning can be to seek out answers together.

Discipline problems can be reduced when everyone has a clear understanding of the facility's specific set of behavior guidelines. Enforcing discipline firmly, eliminating idle threats and actions by staff, and receiving support from supervisory personnel can contribute to reducing staff concerns of being "liked" by campers. Since camp positions are not popularity contests, discipline procedures must be implemented clearly, firmly, and fairly.

Good planning and a well organized program can reduce extra work by staff. This allows a proper amount of rest and can reduce fatigue. Even in today's throw-away society it is important to remember that staff members are not a disposable commodity. Staff schedules should be arranged to provide adequate programming breaks. These periods allow staff to be removed from the continuous flow of events and recharge.

Generally, at the end of a well-managed week-long program, the stress levels are lower and usually fall below beginning score levels. Data also suggest that a group's level of anxiety diminishes as succeeding programs are encountered for subsequent camp groups. Anxiety decreases as staff become more comfortable with their roles and learn what they can expect from supervisors and others.

Camp administrators need to be aware of changes in their staff's stress levels and take appropriate actions to provide training, support and encouragement.

Camp is an important experience for both camper and staff. One important factor resulting in providing better and improved experiences for all participants in a resident camp program is the reduction of stress factors for staff.

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ENVIRONMENTAL EDUCATION ACTION IN WISCONSIN

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Introduction

Environmental Education (EE) is moving forward at a quickening pace in Wisconsin. Universities offer EE courses to preservice teachers. School districts are designing K-12 EE infusion plans and a flurry of inservice courses and workshops are being held. An overview of EE efforts, as it relates to these three areas (i.e. K-12 curriculum, preservice and inservice training) is presented below.

District Infusion: K-12 EE Across the Curriculum

In Wisconsin an Environmental Education (EE) curriculum planning requirement has become established for districts through a legislative standard which reads as follows:

> Develop a written sequential curriculum plan that includes language arts...environmental education... and music. The plan shall specify objectives, course content and resources, and shall include a program evaluation method.

An administrative rule interpreting this and several other school district standards directs the following approach for its implementation:

> Environmental education objectives and activities shall be integrated into the kindergarten through Grade 12 curriculum plans of all subject areas, with the greatest emphasis in the plans for art, health, science, and social studies education.

This standard and its associated administrative rule will go into effect with the 1988-89 school year. A 20% stratified sample of school districts will be audited on site each year.

Since the formalization of EE is relatively new to districts the Wisconsin Department of Public Instruction (DPI) published a document intended to help curriculum planners. The title of this publication is A Guide to Curriculum Planning in Environmental Education.

Across the state, educators are using the Guide to assist in developing their plans. In fact, the Guide is in its third printing and has become popular outside of the state as well. Over 6,000 copies have been sold to educators across the United States, Canada, and 26 other countries.

The Guide promotes the infusion of environmental education into the district curricula and classrooms just as the legislation does. Responding to this, many districts are establishing interdisciplinary curriculum teams to develop the district plans. At the classroom level teachers are encouraged to use Project Learning Tree, Project WILD, and The CLASS Project, along with Investigating and Evaluating Environmental Issues in Action: Skill Development Modules, by Harold Hungerford and colleagues, as "starter programs." To facilitate the incorporation of these materials into curricula, a group of graduate students at the University of Wisconsin-Stevens Point, working with Richard Wilke, Randy Champeau, and Martha Monroe, developed a four-volume handbook, Avoiding Infusion Confusion. This handbook includes an abridged version of the Knowledge Section of A Guide to Curriculum Planning in Environmental Education. Thirty-five principles are listed along with descriptors for concepts associated with the principles.

Most of this handbook consists of matrixes covering facing pages which are identified by concept descriptors and principle numbers. On the vertical axis, the cells are labeled with the names of programs like Project Learning Tree, Project WILD, and The CLASS project, about 10 in all. Cells on the horizontal axis are labeled with the names of five subject areas: art, health, language arts, science, and social studies. Each cell of the matrix identifies activities for the subject area and from the program labeling the cell.

Wisconsin Universities and Environmental Education Preservice Teacher Mandates

On October 13, 1983, the Wisconsin Department of Public Instruction promulgated an administrative rule interpreting "adequate instruction in the conservation of natural resources" (henceforth referred to as environmental education) as it appears in Wisconsin Statutes. This rule affects all teacher education candidates in agriculture, early childhood, elementary, science, and social studies education who graduate and seek licensing after July 1, 1985.

The new rule identifies seven competencies which candidates are expected to acquire during preservice preparation to teach. The administrative code and competencies read:

ADMINISTRATIVE CODE REQUIREMENT IN ENVIRONMENTAL EDUCATION

PI 3.07(1)(d) is created to read:

> Environmental education. Effective July 1, 1985 adequate preparation in conservation of natural resources is required for a license to teach early childhood, elementary education, agriculture, and for secondary education licenses in science and social studies with the exception of philosophy, psychology, and religious studies. Programs shall provide students with the following knowledge:
>
> 1. Knowledge of the wide variety of natural resources and methods of conserving these natural resources;
>
> 2. Knowledge of interaction between the living and non-living elements of the natural environment;
>
> 3. Knowledge of the concept of energy and its various transformations in physical and biological systems;
>
> 4. Knowledge of local, national, and global interactions among people and the natural and built environmental including:
>
>   a. Historic and philosophical review of the interactions between people and the environment;

   b. The social, economic, and political implications of continued growth of the human population;

   c. The concept of renewable and non-renewable resources and the principles of resource management;

   d. The impact of technology on the environment; and

   e. The manner in which physical and mental well-being are affected by interaction among people and their environments;

5. Ability to use affective education, methods to examine attitudes and values inherent in environmental problems;

6. Ability to incorporate the study of environmental problems in whatever subjects or grade level programs the recipient of the certificate of license is permitted to teach through the use of the following methodologies:

   a. Outdoor teaching strategies

   b. Simulation

   c. Case studies

   d. Community resource use and

   e. Environmental issue investigation, evaluation, and action planning;

7. Knowledge of ways in which citizens can actively participate in the resolution of environmental problems.

Beginning July 1, 1985, Wisconsin universities and colleges preparing teachers in any of the five areas listed above have developed for DPI approval, programs which enable teacher candidates to acquire these competencies. The various approaches taken by universities and colleges to meet this mandate are presented below.

Alternative Approaches

The seven competencies of the rule include four which may be described as dealing with environmental content, and three which may be described as dealing with environmental education methodology. Both elements are addressed in programs developed by universities and colleges.

Finally, Wisconsin is instituting a new requirement on completion of a minor (approximately 22 semester credits) by elementary education majors. Previously, students did not have to complete a minor along with their Elementary Education major. In response to this some universities and colleges will be developing EE minors which should add to the depth and/or quality of EE in the schools.

Weekend and Summer Programs: University Extension and Outreach in EE for Teachers

The University of Wisconsin is a land-grant school in an agricultural state, and has developed a very strong extension function. Now that the University is a state-wide system of four year and two year institutions, the extension philosophy permeates many of the campuses. The College of Natural Resources at the University of Wisconsin-Stevens Point has a state-wide mission in natural resources education through the extension and campus faculty. The boundaries of our service area are the edges of the state.

The expectation that UW-SP will provide courses, workshops, and leadership in environmental education, coupled with the increasing demand from school districts and teachers for environmental education information, materials, and credits, has led to the development of several creative systems for meeting these needs.

Publications:

The UW-Extension office in Madison publishes a listing of environmental credit and no-credit workshops, seminars, and courses for adults twice a year. The mailing list is updated with registrations from EE courses and workshops around the state.

The UW-Extension office in UW-SP coordinates the publication of a brochure that lists only the courses offered for credit around the state. Many are specifically designed for teachers. Any university or college can advertise their courses here, and teachers are learning to look for this announcement.

Summer Programs:

For over 20 years, UW has sponsored a series of week-long teacher courses in the summer. These are now held in northern Wisconsin in easy access of two national forests, bogs, glacial features, and vacation spots. Most of the faculty for the program have Extension positions and teach about one aspect of the environment--water quality, geology, plant ecology, etc. The program is heavily support by County Land Conservation Offices, Kiwanis Clubs, Rotary Clubs, Garden Clubs, and the forest industry in the form of scholarships for meals and lodging at a residential facility. Most teachers only pay the cost of tuition to attend the course.

Weekend Courses and Workshops:

UW-SP operates three field stations which host weekend courses for teachers and naturalists. The UW-SP faculty offer courses on: Environmental Education Teaching Methods, EE Curriculum Design, Woodlands/Wetlands, Naturalist Training, and a host of natural history topics. One of these courses also meets a portion of the EE requirement for teacher certification. Most people fulfill this requirement through their undergraduate coursework, but teachers who move to Wisconsin with an out-of-state teaching certificate, or those who add certification after graduation may choose this route for their coursework. A correspondence course offered through UW-EX complements the weekend course to meet all seven of the EE requirements.

Off-Campus Courses:

There is a tremendous need for "traditional" courses in environmental education methods and environmental studies taught off campus and in outlying school districts. These courses typically meet one night a week for the full semester for 2 or 3 credits. The UW-SP faculty can only offer such a course once a year within one hour drive of Stevens Point, and it is unlikely that they will be able to continue this service.

To meet this need UW-SP is developing an Ad Hoc Faculty for Environmental Education. UW-SP will outline a series of one-credit courses that cover the framework of EE with theory, activities, and curriculum materials, and invite environmental educators from across the state to apply for 6-15 Ad Hoc positions. The new "faculty" will receive a two-part training program to become familiar with the mechanisms of teaching for the university and to generate activity ideas and class programs for the courses.

UW-SP will incorporate the Ad Hoc peoples' suggestions and ideas into a set of fairly structured course outlines and assignments. The Ad Hoc faculty will be able to offer these courses, for pay, for UW-SP, to teachers, throughout the state.

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STEPS TO MANDATED ENVIRONMENTAL EDUCATION PROGRAMS IN THE PUBLIC SCHOOLS OF PENNSYLVANIA

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Pennsylvania has had success in requiring school districts of the Commonwealth to include environmental education programs in the curriculum of their students. A history of programs, people and legislation may aid educators in implementing environmental education in other states and school systems.

Historically, Pennsylvania, like most states, had a number of programs with an environmental orientation. The Stone Valley Outdoor Education Center at the Pennsylvania State University was exposing teachers to techniques utilizing facets of the environment in the early 1960s. In the mid to late 60s, the federal Elementary and Secondary Education Act, Title III projects began. Two of the best known in the state were Project Outdoors of Ridley Creek State Park and Project KARE of Bluebell, Pennsylvania.

Let us take a chronological look at the important laws and political happenings in the Commonwealth concerning environmental education.

General curriculum regulations of the State Board of Education (section 7-150) in 1969 stated that "conservation and outdoor education" should be provided in the curriculum of all schools in the state. Further elaboration (Section 7-152) indicated that conservation and outdoor education may be presented in separate planned courses or integrated into other courses.

"It is the belief of the Pennsylvania Department of Education that environmental education (conservation and outdoor education) is interdisciplinary in nature and should be a part of the curriculum for all students. The scope of the subject calls for the expertise of many teachers, parents, and community in developing and conducting a program within the school system. This makes it extremely important that a coordinator or coordinating committee be established and given responsibility for planning and implementing the school's program."

1971--Pennsylvania State Legislature passes resolution which becomes Section 10-27 under Article I of the State's Constitution: The people have a right to clean air, pure water and to the preservation of the natural, scenic, historic and aesthetic values of our environment. Pennsylvania's public natural resources are the common property of all people including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

A variety of college programs were started as a result of the first Earth Day. These programs were designed to provide teachers with a basic background for utilizing environmental education with their students (Chase, 1984).

1973--state Environmental Education Advisory Council was established by the Secretaries of Education and Environmental Resources. This group was charged to "survey the current status of environmental education and prepare an education program plan for kindergarten-grade 12."

1974--report of Environmental Education Advisory Council-first master plan for commonwealth provided:
--necessity of environmental education programs
--recommendations for the Department of Education and Department of Environmental Resource, for implementing K-12 programs, recommendation for cooperation with state and federal agencies and finally, recommendations for implementing teacher education programs in environmental education.

1975--Department of Education released K-12 Computer based Resource Guides in environmental education.

1977--Formal beginning of Pennsylvania Alliance for Environmental Education. Membership composed of educators, resource agency personnel and interested citizens. Open membership.

1977--The Pennsylvania Department of Education released the certification standards for obtaining a teaching license in environmental education. Previous to this only a licensed teacher in another discipline could obtain an endorsement to teach environmental education.

1978--Pennsylvania Department of Education published (a) booklet--Competencies: Environmental Education (1978), as the basis of teacher certification programs. This booklet also contained Standards for College Programs to prepare K-12 Environmental Educators. It provided a way for licenses teachers to add an endorsement to their teaching license in environmental education. (b) requirement that environmental education program is required of each school.

1981--The schools of Pennsylvania began operation under new curriculum guidelines--the twelve goals of education. Number 12 was entitled:
ENVIRONMENT. Quality education shall help every student acquire the knowledge and attitudes necessary to maintain the quality of life in a balanced environment. Objectives are:

--Knowledge of natural and human resources.

--Understanding of geographic environments: local, regional, global.

--Knowledge of interrelationships and interdependence of natural and human systems.

--Development of personal environmental attitudes and values.

--Development of environmental problem solving and management skills.

--Knowledge of and appropriate uses of energy.

It is interesting to note that the original goals did not include ENVIRONMENT. The Pennsylvania Alliance for Environmental Education coordinated a program to bring public pressure to bear. As a result of their efforts, environment was added as the twelfth goal of education.

1983-84--Pennsylvania Environmental Education Master Plan was the result of a 42 person task force appointed by the secretaries of Education and Environmental Resources. This second master plan for the state provided a series of recommendations for the development of environmental education within the state.

1985--One of the recommendations on the Master Plan was to originate and staff an Office of Environmental Education. This office was established under the Department of Education and Dr. Dean Steinhart as director. He states that the top priorities of his office are: to implement inservice training programs, curriculum development and materials dissemination. (Pennsylvania Alliance for Environmental Education Newsletter, 1985).

Legislation, known as Chapter V regulations were enacted that year in all Pennsylvania school districts. As a result:

-The Pennsylvania Department of Education, Office of Environmental Education developed a self compliance document which required superintendents to verify their school district status in environmental education, i.e., that they do offer environmental education for their students.

-On-site visits by staff from the Pennsylvania Department of Education were conducted to review and verify the accuracy of reported information.

1986-The Office of Environmental Education distributed the official scope and sequence for environmental education in the Commonwealth.

1987-New and improved programs in environmental education for teachers and their students are appearing. Noteworthy are the Pennsylvania Fish Commission's Aquatic Resources of Pennsylvania; a new edition of a quality curriculum by the Regional Environmental Education Program (REEP); Lehigh Valley Conservancy's Aquatic Ecology; Bureau of State Parks Activities for Environmental Learning.

Activities for educators include an Enviro-Olympics conducted in forty-five counties. An aid to educators is an annual Environmental Education week, designated by the governor, backed by packets for teachers (for various curriculum levels) from the Office of Environmental Education.

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FUTURE--The Pennsylvania Federation of Sportsmen's Clubs (98,000 members) is coordinating a program to carry environmental education concerns to the governor and is locating legislators willing to pass an appropriate resolution (General Assembly of Pennsylvania, 1987) to encourage the Pennsylvania School Board to strengthen Chapter V regulations to: "assure that Pennsylvania youth will be encouraged to develop an environmental literacy." In addition, a House Bill #1013 was introduced "providing for an environmental education program and activities of the program and authorizing the appointment of an advisory council on environmental education." (General Assembly of Pennsylvania, 1987)

The 1987-88 Pennsylvania State Education Association's Resolutions state--under Article IV--To Advance Educational Standards--Section 87-122-Environmental Education: The Association believes that the Nation's priorities must include the protection of our environment. It urges the development and improvement of federal legislation, programs, and appropriations that provide education: (A) for use, stewardship, and preservation of a viable environment (B) to minimize pollution, and (C) to promote an understanding of the effects of population change.

The Association urges its locals to support appropriate programs in their school systems for kindergarten through adult education.

In closing, the Commonwealth of Pennsylvania realizes that the future welfare of its citizens depends upon programs voted upon by its inhabitants. The basis of a quality life in the twenty-first century would seem to be tied to the environmental literacy of its citizens. The aforementioned laws and programs are a catalysts' for this change.

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ENVIRONMENTAL EDUCATION FOR QUEBEC'S YOUTH AND EDUCATIONAL INSTITUTIONS

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Environmental education in Quebec advanced significantly during the 1970s. Its underlying principles are based on the Belgrade Charter (1975) and the Intergovernmental Conference on Environmental Education (Tbilisi 1977). In Quebec, this type of education is provided by various government departments, teaching networks and environmental agencies such as interpretation centers, and environmental groups and associations.

Several youth associations, particularly those working in the area of scientific leisure activities, have integrated environmental education into their programs. Two Montreal-based organizations, the Heritage Montreal Foundation and the Montreal Museum of Fine Arts, have developed a teaching program adapted to the local milieu. Their programs deal mainly with architectural heritage and the overall urban environment.

A number of Quebec organizations are currently working to initiate and promote environmental education in areas such as recovery, recycling, the protection of whales in the St. Lawrence estuary, and the protection of green spaces in urban areas.

Environmental Education Facilities Implemented By the Quebec Government

Certain government departments--the ministere de l'Environnement, the ministere de l'Energie et des Ressources, the ministere du Loisir de la Chasse et de la Peche and the ministere de l'Education, to name a few--have created a number of facilities, services and programs to help the various local agencies carry out activities dealing with the environment.

In Quebec's Provincial Parks. Quebec's network of provincial parks falls under the jurisdiction of the ministere du Loisir, de la Chasse et de la Peche. This Department is therefore in touch with a large number of users on a regular basis. Its educational activities are directed at all groups, with particular emphasis on school-aged children.

Based on the infrastructure of Quebec's provincial park network, the Department's nature education policies stress visitor reception, awareness of rules and regulations, nature interpretation and outdoor activities encouraging close contact with nature.

Each year, the ministere du Loisir, de la Chasse et de la Peche organizes a "Conservation Week" aimed at educating schools groups in matters of wildlife conservation.

Forest Education Centers. The forest is one of Quebec's major renewable resources, and one that we must learn to understand and work to protect. The conservation education program and other projects undertaken by the ministere de l'Energie et des Ressources have been set up so that judicious, planned use of the forest will ensure its continued survival.

As tangible evidence of its role as an educator, the Department has set up a network of forest education centers. These are specially designed and laid out reception centers located in forested areas with guides to help visitors familiarize themselves with the local and regional forest environment.

Each forest education center has an interpretation building and a network of trails. Nature interpretation is the central activity at most centers and the 9-12 age group, the main target group.

Elementary and Secondary-Level Teaching Programs. Revision of elementary and secondary school programs in the early 1980s favored the incorporation of environmental awareness and education into certain programs; for example, natural sciences and social sciences programs at the elementary level, and ecology, geography, and personal and social development classes at the secondary level.

The natural sciences program in elementary schools is proving a particularly interesting example of a program based on environmental awareness and education. This program takes into account both the student and the environment, as well as the relations between the two.

Environmental Education at Quebec's Ministère de L'Environnement

When it was created in 1979, the ministere de l'Environnement de Quebec gave itself the mandate of educating the public on issues pertaining to the environment. This mandate was entrusted to the Department's education branch, the Division de l'education, in particular, but also to each of its regional offices.

The Division de l'education, a team of three to five people, is responsible for promoting environmental education at all levels, that is, as much in the formal education system as in the informal networks, be it through adult or youth education programs, or popular education programs.

Ministère de l'Environnement Achievements in the Area of Environmental Education. Department achievements fall into two main groups: environmental awareness activities, and activities intended for young people and educational institutions.

Environmental Awareness Activities. For the past few years, activities conducted by the ministere de l'Environnement with regard to environmental education have been aimed at developing public awareness in matters concerning the environment.

Environmental Simulation: A Teaching Tool. Education specialists with the ministere de l'Environnement have produced an environmental simulation program, whose setting is a small town of 25,000 inhabitants. Members of local associations decide to establish municipal development policies aimed at protecting and restoring the environment.

The simulation uses role-playing, with actors portraying typical citizens involved in the social, economic and municipal life of the city, for example: a member of the Kiwanis Club, the chairman of the municipal environment commission, the president of the industrialists association, and so forth.

The simulation is divided into three parts: the first two center on team work, while the third is a plenary session in which the mayor calls a meeting with the municipal council.

Research on Environmental Education in Colleges. Last year, the ministere de l'Environnement du Quebec undertook a research project to obtain a better understanding of the importance placed on environmental education in colleges.

More specifically, we want to know how much emphasis is placed on environmental issues in courses, programs and subjects currently being taught to 130,000 students between the ages of 16 and 21 in Quebec colleges. How are environmental issues being dealt with? Is the environment being treated as a series of individual elements or is it being looked at globally? Is any importance accorded to the relationship between man and his surroundings, or the quality of one's physical environment? How much importance is accorded to the buildings and houses we work and live in?

Our research will include analyzing the pedagogical approach to environment-related courses and collecting data on environmental concerns in student activities. The overall study will constitute a preliminary outline and assessment of the contribution of college education to the continuing process of environmental education.

The first report based on this research will focus on the analysis of environmental education courses and will be published in early 1988.

Achievements Related to Youth and Educational Institutions. The ministere de l'Environnement has chosen elementary and secondary students as its primary target group, both because the classroom is the best place to reach elementary and secondary school students, and because it remains one of the principal places where values are formed. But in addition to the classroom, the home, the street, parks, youth associations, and television all contribute in their own way to establishing attitudes and behavior vis-a-vis the environment. For this reason, the educational programs and policies of our Department do not address only the schools but also other areas to which today's youth is exposed.

Teaching Material for the James Bay Cree. Native peoples living near James Bay are in charge of managing local education. The regional school board decided to enlist the help of the ministere de l'Environnement and the ministere de la Sante et des Services sociaux to establish an educational program aimed at raising the environmental awareness of young Cree.

To do this, the school board created three teaching tools for elementary students and their teachers. This material, which deals with health and the environment and reflects the Cree culture, was produced in three languages: Cree, French and English.

In the fall and spring, the Cree travel far from their villages to hunt geese. As a rule, the entire family takes part in these seasonal migrations. In recent years, Cree school authorities have therefore adapted the school calendar in each community so that the students can join their families and participate in the traditional hunting activities. The video was created with this period and these activities in mind.

Activities included in the guide and school calendar take place over a six-week period. The themes focus on safety measures, hunting regulations, and environmental protection: garbage collection, the prevention of water pollution and respect for nature.

Publications on Acid Precipitation for Ages 12-16. In Quebec, as elsewhere in North America, acid precipitation is currently one of the environmental issues causing the most concern for the public, and for school-aged youngsters. For this reason, hundreds of students from all over Quebec signed a petition last year asking the Canadian and American heads of government to find solutions to the problem of acid precipitation. Other groups of students organized "environment days" to show their concern about this particular form of pollution.

In 1983, Quebec´s ministere de l´Environnement published a booklet entitled "Acid Precipitation or What Goes Up Must Come Down" as well as a poster for secondary school students.

Given the degree of student interest in this issue and the importance of the problem, the ministere de l´Environnement du Quebec decided to develop a teaching guide to go along with the booklet. The software package, in the form of a simulation, addresses mainly ecology and general geography students at the junior high school level.

In wishing to address acid precipitation, we were confronted with a complex problem. This phenomenon has both an economic and environmental impact; it affects conservation, air quality, and the balance of ecosystems. Acid precipitation can also be analyzed from the point of view of man's relationship to the various elements of the environment. In order to transfer these diverse topics to the classroom, we chose a modern tool: computer software. It allows us to deal with the various aspects of the issue and to conduct activities which would otherwise be impossible.

The software package takes the form of a simulation in which the student tries to guess who is responsible for a particular problem and find solutions. We feel that this approach will be popular with students. The software package has three main components: an introduction explaining the problem of acid precipitation, the detective game described above, and a seminar conducted by the student. There are also two other sections: the organization of a second seminar on an issue other than acid precipitation and a section to be used by the teacher.

The software's introductory section discusses the problem of acid precipitation and then shows how the environment is affected. Three characters represent the environment: a frog, a maple tree and a statue.

The detective game constitutes the lion's share of the software package. It invites the student to discover the causes and agents responsible for acid precipitation through observation. The investigation begins with a analysis of three different milieus: water, city and forest. It continues with an interview of various witnesses to the crime: a statue, a tree, a frog, a fish, and a human. Then, the student studies the different files. The investigation ends with a questioning of the suspects: sulphur dioxide, ozone, methyl mercury, nitrogen oxides and carbon monoxide.

The third part of the exercise has the student conducting a seminar. His guests come from various milieus and are represented by a statue, a fish, a plant manager, the Minister of the Environment, a maple tree and a director of a citizens' committee. During the seminar, participants share their views on the proposed solutions for decreasing acid precipitation, thereby enabling the students to understand the various concerns of the guests and the difficulty of reaching a consensus.

THE LIVING ENVIRONMENT: RESOURCE BASE FOR SCIENCE TEACHERS

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Environmental topics can be particularly effective to illustrate scientific principles and to motivate students for the study of science. However, the integration of such topics in the classroom is impeded by the fact that a thorough development of environmental issues often requires knowledge of several branches of science and may even necessitate experience outside the classroom. A typical classroom teacher rarely can be expected to have the requisite background, facilities, or equipment, let alone the luxury of time to integrate such topics in the courses of study in the typical public school classroom. On the other hand, the educational benefits to be gained by direct involvement with a scientific activity of obvious and immediate personal value are difficult to overestimate. This paper reviews a program designed to assist practicing teachers in overcoming these obstacles through the use of local resources and resource persons. The program makes intense use of local environmental resources, is highly interdisciplinary, is adaptable to many grade levels, and is easily replicable.

Local Resources Can Enhance Science Education

Local industries, public and private agencies, and service organizations often have unique resources and personnel who are willing to assist the classroom teacher if given the opportunity. In the author's experience, local corporations frequently seek means of interaction with students and teachers but are hampered by a lack of infrastructure to make the necessary contacts. Environmental centers can assist in bridging these gaps. While the specific resources within a given locale may vary, the procedures and principles employed to bring these resources together with educators are universal. One need only identify a few environmental topics of local interest, make contact with the appropriate agencies and personnel, and then organize to provide logistical support and a framework for interaction between the various parties involved.

The Center for Environmental Programs at Bowling Green State University (BGSU) was used as an agent to do just this. The personnel and facilities of the Center were organized to promote a program of environmental interest and to provide local science teachers with an opportunity to interact with several resource persons and environmental agencies in the immediate area. An intensive summer workshop was developed to provide instruction to the participating teachers, to get practicing teachers to several locations of environmental and educational interest, and to provide the organizational structure and oversight to assist with curriculum development. Follow-up activities were provided to ensure utilization in the classroom. While the structure of this particular workshop is unique, the concept and procedures are generic and are easily replicable by environmental educators elsewhere. Several interesting features and developments to the program are noteworthy and should be of general interest to the environmental education community.

The BGSU Program

BGSU is a medium-sized, comprehensive, state-assisted institution of higher education located in the northwest quadrant of Ohio. The University maintains strong ties with the local education community through its College of Education and associated teacher training programs. Science content instruction for education majors at BGSU is offered primarily through the departments of biology and geology, and to a lesser extent by the departments of chemistry and physics within the College of Arts and Sciences.

The Center for Environmental Programs is organized as an interdisciplinary center within the College of Arts and Sciences, but degree programs in three separate colleges are coordinated through the Center. As such, the Center is a logical point from which to mount an interdisciplinary, environmentally-focused science effort at BGSU, and it accordingly assumed administrative responsibility for this program. Staff of the Center handled recruitment, budget administration, communications with participants, credit arrangements, and generally all logistical details and arrangements with external parties. The department of biological sciences provided space and facilities for the on-campus workshop and supplied the primary instructor for ecological components of the program. The College of Education provided staff to supervise and assist with curriculum development, follow-up, and monitoring.

External speakers were employed to provide input for special topics such as species preservation, conservation versus recreation, water quality, chemical and toxic waste, and agricultural practices. Included were representatives from the city water department, the local zoo, the Toledo Metropark system, the Nature Conservancy, the Sierra Club, the U.S. Fish and Wildlife Service, the Ohio Department of Natural Resources, the U.S. Forest Service, the National Oceanic and Atmospheric Administration, and the U.S. Environmental Protection Agency. Local industry participants included representatives from agribusiness enterprises, from the chemical industry, and from the recreation and tourism industry.

Program Content and Format

The topics of environmental geology, ecology, species preservation, conservation vs. recreation, biotechnology in agriculture, water quality, and the interaction of man and environment were selected for emphasis. These topics were selected partly because of local interest and availability of facilities, and partly because of general applicability and importance to the public school science curriculum. Junior-high level Science teachers were targeted because it was felt this group would have the largest impact on the local school community. The program was limited to 40 participants primarily because of locally available resources, but even this number proved to be excessive for some laboratory and field trip exercises.

The basic program consisted of an intensive two-week workshop held at BGSU during the summer of 1987 plus follow-up activities during the subsequent school year. Included during the two-week period were lectures by local and invited speakers, panel discussions, laboratory activities, films, curriculum development exercises, and four field trips to local sites of environmental interest. Academic year follow-up was provided through classroom visits by workshop staff and by collective follow-up sessions. Continued dissemination and peer interaction is promoted through a newsletter and computer network organized by the Center for Environmental Programs at BGSU.

Three semester-hours of graduate science credit were offered as an incentive for practicing teachers to attend. This credit was arranged through the department of biological sciences at BGSU and proved to be a strong incentive for workshop attendees. Indeed, the willingness to enroll for credit was used as a criterion by which to select applicants for the workshop. To receive credit, participants were required to meet admission standards of the BGSU Graduate College, complete two papers during the workshop, evaluate one computer program, satisfactorily pass a written examination at the end of the program, and complete a curriculum module based on some environmental topic covered in the workshop. Tuition and fees for teachers accepted into the program were covered by a grant from the Ohio Board of Regents.

Field Trips and Special Activities

Points of interest visited on field trips included: The Ottawa National Wildlife Refuge on Lake Erie; Old Woman Creek National Estuarine Sanctuary at Huron, Ohio; Blue Hole geological features near Castalia, Ohio; Kitty Todd Nature Preserve, Toledo, Ohio; Oak Openings Metropark, Toledo, Ohio; stream sampling in the Maumee River near Grand Rapids, Ohio; glacial moraines and flood plain geology in the region; the water intake plant for the city of Bowling Green; the city wastewater treatment plant; sampling in creeks, ponds, and streams near campus; visiting a no-till farm in the area; and a trip to the local zoo. Clearly, these points of interest are site-specific and would vary depending on availability and interest of any regional program. On the other hand, Northwest Ohio certainly has few special or unique features not found in many other locales. The use of personnel from the city utilities, park district, and from the regional and state departments of natural resources, is easily transferable.

Outcomes and Products

At the end of this program, 40 practicing science teachers in 30 different school districts in northwest Ohio were trained. These teachers ultimately will affect the education of some 4000 students directly in their classrooms. Approximately 100 lesson plans based on environmental topics were developed and shared among all participants. Computer programs were demonstrated and shared. Not only has continuing contact between university staff and practicing teachers been established, but also peer interaction is promoted through the continued sharing of lesson plans and ideas among the participants. At a recent program in which participants were brought together again, environmental activity in the classroom was noted by virtually all attendees. Nearly half had either completed or planned a field activity based on the summer experience. One teacher already had completed two field trips and developed two separate units for use in an ecology class. Participants were introduced to a significant body of environmental literature and to many local resources and resource persons which otherwise would be underutilized. In general, we believe such programs contribute significantly to increased environmental awareness and to improved science education on the part of all concerned, and we encourage other environmental centers to participate in similar programs.

Persons interested in more specifics of this program may write for a detailed agenda.

Note: "The Living Environment" Program is supported by the Ohio Board of Regents through a grant from the Education for Economic Security Act.

EDUCATIONAL MATERIALS ON THE GREAT LAKES: FOCUSING ON AN ECOSYSTEM APPROACH

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As fresh water becomes increasingly scarce for much of the world's people due to changes in climate and use of the earth's resources, the value of the Great Lakes as the world's largest source of fresh surface water cannot be underestimated. In order to protect this vast yet fragile resource, environmental educators in all regions must help others understand the importance of protecting this freshwater ecosystem for use and enjoyment by humans and the thousands of other species which inhabit the lakes.

The Great Lakes hold one-fifth of the world's fresh surface water, and the combined shoreline of the five lakes covers one-half the circumference of the earth. More than three-fifths of Canada's population and one-fifth of U.S. citizens live in the region; of these, half of them receive their drinking water from the Great Lakes. When the economic value alone is totaled from recreational use, shipping, fisheries, water consumption and industrial use, the lakes provide more revenue to the Great Lakes region than any other source.

For all the lakes have given to us, we have not treated them as a natural resource worth protecting. Industrial and municipal misuse over the last century, loss of wetlands, inputs of pollution from the atmosphere, improper management, and severe degradation from excessive nutrient inputs have left an impact.

Because of these problems, Canada and the United States signed the Great Lakes Water Quality Agreement in 1972 to develop programs to restore and protect the Great Lakes Basin Ecosystem. The International Joint Commission (IJC), a binational agency between the two countries charged with preventing and resolving disputes along the boundary waters, is responsible for monitoring progress by the two countries to fulfill the goals of the Agreement.

The 1972 Agreement focused on limiting phosphorus inputs into the lakes as a result of serious eutrophication problems in many nearshore areas, particularly for Lake Erie. More than eight billion dollars has been spent by both countries to upgrade municipal treatment facilities and limit nonpoint sources of nutrients, and considerable success have been achieved in this area.

By the mid-1970s, however, toxic contamination had come to the forefront as the major threat to the lakes, and the two countries revised and resigned a Great Lakes Water Quality Agreement in 1978. It includes goals, such as the virtual elimination of persistent toxic substances into the Great Lakes basin and specify objectives for several contaminants.

Most importantly, the Agreement commits the two countries to an "ecosystem approach" in preserving and protecting the Great Lakes Basin Ecosystem; that is, recognizing the interdependent nature and effects between everything within that system. In drafting this Agreement, the writers chose the word "ecosystem" rather than environment because it denotes a greater interaction between humans and their surroundings, and thus forces citizens in the basin to consider their part in altering the quality of the Great Lakes Basin Ecosystem.

The goals of environmental education--to produce a citizenry that is aware of and understands the interdependency of humans with nature, the environmental costs when we do not use natural resources efficiently, and how to become involved in helping to solve these problems--are essential in order to accomplish the goals of the Agreement. In order for citizens in the basin, and others throughout the world, to understand the role they play in restoring and protecting the Great Lakes, they must develop an awareness of this interdependency that is central to environmental education and to the Agreement.

In recognition of this mutual concern, the IJC's Science Advisory Board surveyed educators in 1984 and 1987 to determine what materials were available to teach learners about the Great Lakes, the ecosystem approach, and our role in protecting the Lakes. The results showed that teacher resource materials are available from a variety of sources, such as citizen organizations, governmental agencies, universities and their associated programs (Sea Grant programs in the United States, for example). Many of these are technical documents that teachers use to develop their own curriculum materials, or pass on directly to their students for upper grade levels.

Materials which have been produced since 1978 and thus deal with toxic contamination issues are mostly aimed at the secondary school and/or adult education levels, while materials for younger audiences are from earlier years and focus on subjects such as geography, history, shipping and fictional stories about the Great Lakes. Few materials in any format were listed in survey results that address an ecosystem approach and human use issues. It was concluded that either these materials are not being produced, or teachers are not finding out about them if they have been developed.

Finally, almost 90 percent of teachers who responded to the survey felt that classroom-ready, participatory materials which focus on the ecosystem approach and wise management of the Great Lakes are needed at all age levels. The Science Advisory Board produced a directory of Great Lakes Education Material as a result of the survey, and initial supplies of the booklet were deleted in only four months. Reprinting is expected in early 1988.

Those involved in restoring and protecting the Great Lakes are working to implement the same goals as those in environmental education, by creating an awareness and understanding of the interrelatedness of everything in the ecosystem. As a part of that ecosystem, we must change those parts of our behavior which alter and may eventually destroy our valuable environment, the Great Lakes. In order for those of us working on the Agreement's goals to accomplish our task, you as environmental educators must continue your valuable work to create that sense of understanding in citizens throughout the region, and the world.

For further information about specific materials on the Great Lakes, please contact the author at the International Joint Commission, Great Lakes Regional Office, P. O. Box 32869, Detroit, MI 48232 or 100 Ouellette, Eighth Floor, Windsor, ON N9A 6T3. In the U.S. call (313) 226-2170 and in Canada (519) 256-7821.

INTERNATIONAL JOINT COMMISSION

--Formed by 1909 Boundary Waters Treaty; "prevent and resolve disputes along the boundary waters."

--Three Commissioners chosen from each country, appointed by U.S. President (with advice and consent from Senate) and Canadian Prime Minister.

--Three primary functions:

  --Applications: approve structural works (water quantity)

  --References: study issues as referred by governments (water quality or quantity)

  --Arbitration: make binding decisions for governments on issues (never used to date)

--Major role is advisory only; do not have authority to enforce rules or laws. Instead, make recommendations to governments of actions that need to be taken to fulfill agreements or prevent damage to boundary water system.

1978 GREAT LAKES WATER QUALITY AGREEMENT

--Between United States and Canada

--Both federal governments commit to:

> "The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated."

--Specific Water Quality Objectives established for 24 persistent organic and inorganic toxic substances.

--Programs developed to abate, control and prevent pollution from discharges from industrial sources and other land use activities, such as forestry, agricultural development, etc.

--Measures are taken to rehabilitate specific areas affected by persistent toxic substances (i.e., 42 Areas of Concern, which were first identified by the IJC in 1973).

- --Support monitoring and research programs to identify presence of toxic substances and their effects on human health.

- --Most importantly, promotes AN ECOSYSTEM APPROACH.

THE ECOSYSTEM APPROACH

A Comprehensive Approach to Use Management of the Great Lakes

- --Definition: "The complex interrelationships between the air, the land surrounding the lakes, the streams flowing into them, wildlife, humans and the lakes themselves must ALL be considered in any effort to restore and protect the Great Lakes Basin Ecosystem."

- --ENVIRONMENT = HOUSE (external) VERSUS ECOSYSTEM = HOME (internal and external)

  HOMES = Huron
  Ontario
  Michigan
  Erie
  Superior

- --ECOSYSTEM APPROACH includes the following principles:

  - --Preventive vs. reactive

  - --Control pollution at its source

  - --Interrelatedness requires focusing actions on the sum or entire ecosystem, not just on parts (i.e. air programs, wildlife programs, etc.)

  - --Use Best Available Control Technology (BACT) to control pollutants, not only that which is most economically feasible. Consider the long term or future as part of the present.

  - --Cooperative participation between agencies, public, legislators.

--Integrated programs for all pollution controls, including monitoring.

ORGANIZATIONS PROVIDING GREAT LAKES MATERIALS

INTERNATIONAL JOINT COMMISSION
Great Lakes Regional Office
100 Ouellette Avenue, Eighth floor
Windsor, ON N9A 6T3
OR P. O. Box 32869, Detroit, MI 49232
(313) 226-2170

THE CENTER FOR THE GREAT LAKES
435 N. Michigan Avenue, Suite 1408
Chicago, Il 60611
(312) 645-0901

GREAT LAKES COMMISSION
2200 Bonisteel Blvd.
Ann Arbor, MI 48109
(313) 665-9135

GREAT LAKES FISHERY COMMISSION
1451 Green Road
Ann Arbor, MI 48105
(313) 662-3209

GREAT LAKES TOMORROW
P. O. Box 1935
Hiram, OH 44234
(216) 569-7015

STATE SEA GRANT PROGRAMS

STATE ENVIRONMENTAL EDUCATION COORDINATORS

LAKE MICHIGAN FEDERATION
8 South Michigan Avenue
Chicago, IL 60603
(312) 263-5550

GREAT LAKES UNITED
24 Agassiz Circle
Buffalo, NY 14214
(716) 886-0142

ONTARIO MINISTRY OF THE ENVT.
135 St. Clair Avenue West
Toronto, ON M4V 1P5
(416) 973-6482

PUBLIC FOCUS (Great Lakes coloring books)
720 Bathurst Street, Fourth floor
Unit Three
Toronto, ON M5S 2R4
(416) 536-9161

U. S. EPA GREAT LAKES NATIONAL PROGRAM OFFICE
536 South Clark Street
Chicago, IL 60605

STATE DEPT. OF NATURAL RESOURCES,
ENVIRONMENTAL PROTECTION AGENCIES

CONTRIBUTION OF ENVIRONMENTAL LEGISLATION TO ENVIRONMENTAL EDUCATION

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ABSTRACT

Towards the end of the 1970´s, the Quebec Legislature enacted various measures to allow public participation in decision-making processes in the fields of conservation, environmental protection and resource management. The current legislative framework is described and the special measures created to encourage participation are discussed.

The influence of this recent legislation is analysed, especially on the emergence of well-educated and highly organized citizens´ groups and the development of professionnal skills among conservationists. Illustrative cases are reviewed in the context of the Environment Quality Act, the Parks Act and the Act Respecting Land Use Planning and Development. Opportunities for individuals engaged in Environmental Education are outlined with reference to public participation in decision making.

CONTRIBUTION DES LOIS ENVIRONNEMENTALES A L´EDUCATION EN MATIÈRE D´ENVIRONNEMENT

Ce texte développe une hypothèse que les spécialistes et praticiens devront vérifier: les repercussions des divers processus de consultation prévus par la loi sur l´émergence de groupes de citoyens compentents en matière d´environnement.

Les groups d´environnementalistes existent depuis bien avant l´apparition de ces processus, mais on peut se demander dans quelle mesure l´encadrement des audiences publiques n´a pas contribue a un discours coherent, structure et articule, même si les interventions antérieures étaient pour autant de qualité.

Davantage de questions, donc, que de réponses. L´auteur reste neamoins convaincu que son hypothèse se vérifierait par un examen systématique des memoires des organismes environnementaux de la dernière decennie et une analyse de leur histoire récente.

1. Lois a caractere environnemental au Quebec

Au Quebec, les lois touchant a la conservation des ressources, l'amenagement du territoire et la protection de l'environnement sont la Loi sur la qualité de l'environnement, la Loi sur les Parcs, la Loi sur l'amenagement et l'urbanisme, la Loi sur la conservation et la mise en valeur de la faune, la Loi sur les réserves écologiques, la Loi sur la régime des eaux, la Loi sur la protection du territoire agricole et dans une certaine mesure, la Loi sur les biens culturels. Soulignons également la recente Loi sur les pesticides.

Certaines de ces lois accordent une place a la participation du public:

1. Loi sur la qualité de l'environnement

7. Un organisme de consultation (...) est institué sous le nom de "Conseil consultatif de l'environnement".

8. (...)

Il peut (...) a la demande de personnes ou de groupes, formuler un avis sur les politiques en matière d'environnement.

Il peut, a ces fins, entreprendre les études necessaires.

31.3. Après avoir recu l'étude d'impact sur l'environnement, le ministre la rend publique et indique a l'initiateur du project d'entreprendre l'étape d'information et de consultation publique (...).

Une personne, (...) peut, dans le delai prescrit (...), demander au ministre la tenue d'une audience publique (...).

A moins qu'il ne juge la demande frivole, le ministre requiert le Bureau de tenir une audience publique et de lui faire rapport (...).

2. Loi sur l'amenagement et l'urbanisme

12. Le conseil de la municipalité regionale de comte adopte, par résolution, une proposition preliminaire d'amenagement afin de permettre la consultation sur le contenu du schema (...).

(...).

13. Un resume (...) est transmis par courrier ou autrement distribué par la municipalité regionale de comte a chaque adresse civique (...).

(...).

14. Chaque municipalité doit, (...), expedier au conseil de la municipalité regionale de comte un avis sur la proposition preliminaire.

Avant de donner son avis, le conseil municipal peut soumettre la proposition preliminaire d'amenagement a la consultation, lors d'une assemblée publique (...).

(...).

18. Le conseil de la municipalité regionale de comte adopte par resolution la version definitive de son schema d'amenagement et procede a une consultation sur les divers éléments du schema et les consequences de son adoption.

(...).

20. La version definitive est soumise a la consultation lors d'assemblées publiques tenues par une commission que le conseil de la municipalité régionale de comte doit creer par résolution (...).

(...).

24. Au cours de l'assemblée, la commission du conseil de la municipalité regionale de comte doit expliquer la version definitive du schema et entendre les personnes et organismes qui désirent s'exprimer.

3. Loi sur les parcs

4. Un parc peut être creé ou aboli par le gouvernement qui peut aussi en modifier les limités ou la classification, si le ministre a préalablement:

a) donne avis de l'intention de creer ou d'abolir le parc ou d'en modifier les limités ou la classification dans la Gazette officielle du Quebec ainsi que dans un ou deux journaux (...);

b) accorde un delai de soixante jours a compter de la publication de cet avis pour permettre aux interesses de lui transmettre leur opposition écrite;

c) entendu les personnes visées dans le paragraphe b en audience publique.

(...).

Les articles 7 et 8 de la Loi sur la qualité de l'environnement, adoptes en 1972, ont permis au Conseil consultatif de l'environnement de tenir des audiences publiques pour preparer des avis au ministre de l'Environnement.

Les autres dispositions remontent a la fin des années soixante-dix et representent un courant favorable de l'Etat a l'égard de la participation du public aux processus decisionnels.

2. Processus de consultation

Les processus enumerés ci-dessus comprennent deux phases: information et audience. La phase d'information consiste généralement a remettre au public un dossier complet sur un projet. C'est en matière d'environnement que ce processus est le plus élaboré et formaliste. Cette étape permet de prendre connaissance d'un projet en detail, de recueillir des renseignemeuts additionnels et de préparer les interventions.

Les audiences constituent la deuxième etape. Les intervenants y expriment leur position verbalement ou par un memoire.

Le processus est strictement consultatif et la décision appartient a l'autorité gouvernementale ou municipale, aucunement liée par les interventions.

3. Effet présumé sur les organismes

Avec les audiences publiques, les organismes environnementaux se sont vus imposer de nouvelles regles du jeu. Les seules ressources qui leur etaient auparavant accessibles, lobby et sorties dans les medias, etaient tres subjectives.

Les audiences ont crée un contexte nouveau: la possibilité de faire valoir des arguments devant une tribune objective et en public et en même temps, la contrainte de réagir aux interventions d'experts et de spécialistes devant ce même public et devant la commission qui entend l'audience. Ce contexte ne laissait guère de place a l'amateurisme, a l'improvisation ou au sensationnalisme, engendrant des débats de plus en plus interessants et valables. Le processus d'audiences est devenu de plus en plus credible.

Dans le domaine des études d'impact, deux grandes categories d'intervenants se sont dégagées: les organismes locaux ou regionaux mobilises essentiellement contre un projet dans leur territoire et les organismes nationaux intervenant a plus d'une audience sur des questions de principe. Ces derniers sont des organismes populaires tels que la Societé pour vaincre la pollution (S.V.P.) ou organismes professionnels comme l'Association des biologistes du Quebec. Plusieurs organismes nationaux sont intervenus, par exemple, lors des audiences sur les pulvérisations contre la tordeuse des bourgeons de l'épinette, parvenant a mettre sérieusement en doute les études du promoteur sur les effets des pulverisations.

Plus recemment, le groupe local Contestension-Portneuf a contribué a provoquer la tenue d'une audience sur un projet de ligne hydroélectrique au-dessus du fleuve Saint-Laurent.

En matière d'audiences sur les parcs, on peut signaler celle du Parc du Mont Saint-Bruno, où un groupe local, le Comité pour la protection du Mont Saint-Bruno, s'est distingué dans l'orientation a donner a la vocation de ce parc.

En matière de consultation publique sur les schémas d'aménagement du territoire (*Loi sur l'aménagement et l'urbanisme*), citons le cas de l'Association pour la protection de l'environnement du lac Saint-Joseph, dont le mémoire, par ses arguments fort sérieux, a contribué a bloquer l'approbation du schéma d'aménagement de la municipalité régionale de comte jusqu'a ce qu'une étude écologique du lac Saint-Joseph soit effectuée.

4. Role des educateurs

C'est l'effet mobilisateur des audiences qui influence les groupes locaux alors que les groupes nationaux interviennent moins spontanement et plus systématiquement. Dans les deux cas, cependant, les éducateurs en matière d'environnement ont un role clé a jouer, d'une part en sensibilisant les corps intermédiaires de leur milieu aux questions environnementales et d'autre part, en situant ces questions dans leur juste perspective. Le triste dossier de la chasse aux phoques est un exemple de situation ou les enjeux environnementaux ont été faussés par le sensationnalisme. L'Association des biologistes a tente de rectifier le tir. Les opposants à la chasse l'ont cependant emporté. Par une éducation bien orchestrée du public, ce dossier n'aurait pas connu le sort que l'on sait.

CONCLUSION

De plus en plus, les citoyens ont droit au chapitre sur les questions environnementales. Ils ont besoin d'être guides, instruits. Beaucoup d'organismes ont acquis une grande crédibilité par des interventions bien structurées. La consultation publique demeure un phénomène recent et l'évolution des organismes environnementaux n'est pas complète.

Les professionnels de l'éducation en environnement ont une occasion d'exercer leur role qui ne peut être que benefique pour les milieux engagés dans une consultation en matière d'environnement et ils peuvent compter sur la collaboration d'un organisme professionnel comme l'Association des biologistes du Quebec.

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PUBLIC HEARINGS: INTERACTIVE ENVIRONMENTAL EDUCATION

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ABSTRACT

Among all the approaches used in environmental education, public hearings on environmental impact statements have proved to be among the most sophisticated and efficient. Based on the most recent techniques in interpreting scientific information, such hearings reach the general public, more specifically individuals and groups concerned with the particular issues. Most importantly, they involve directly the promoters of particular projects and the ultimate decision-makers.

Following the establishment of formal procedures in both Canada and Quebec, considerable expertise of real value has been developed. The quality of information provided and the agreement of all the participants involved are essential conditions for the success of these exercises in informing, educating and consulting.

Tested in the difficult arena of social conflict, the prerequisites for enlightened participation have shown themselves to be adequate. Taking the recent example of the hearings on the waste water treatment proposal for the Quebec Regional Authority, our presentation describes this art of honest and balanced dialogue, capable of motivating citizens to learn the true dimensions of a proposed project and to participate willingly in the public evaluation of it.

AUDIENCES PUBLIQUES: UNE EDUCATION ENVIRONNEMENTALE INTERACTIVE

Deux processus socio-environnementaux ont beaucoup d´affinités: l´éducation permanente (aux adultes) en environnement et la consultation publique sur les consequences environnementales des projets.

Processus interactif d´education environnementale

A travailler sur le terrain avec les citoyens, on se rend vite compte que les procédures d´audiences publiques sur les répercussions environnementales des projets sont des méthodes tres sophistiquées, très efficaces et très populaires d´éducation a l´environnement, même si ce n´est pas leur objectif premier et qu´elles ne peuvent alors être considerées comme telles.

Par contre, l´information des citoyens sur toutes les dimensions d´un projet et sur ses conséquences sur leur milieu de vie compte au nombre des mandats explicities des diverses commissions chargées de mener ces audiences. Forcées de rejoindre un bassin large de citoyens et d´établir les bases d´un débat honnête, pertinent et rationnel sur des projets, les commissions ont ainsi developpé au fil de leurs audiences des techniques découlant a la fois de la communication publique et de la pédagogie environnementale pour amener citoyens, promoteurs et spécialistes d´abord a se comprendre les uns les autres en s´exprimant dans un langage commun et ensuite a avoir des discussions éclairées sur des sujets la plupart de temps très complexes et faisant souvent appel a des notions d´un haut niveau d´abstraction. Cette expertise d´une grande valeur peut être source d´inspiration pour des spécialistes de l´éducation de l´environnement ayant a intervenir dans d´autres contextes.

Peut-on toutefois parler d´un processus d´éducation environnementale en referant a une audience publique? Voyons quelles sont les caracteristiques de tels proccessus de consultation et comment elles peuvent s´apparenter à un processus d´education.

1. Les sujets:

   Chaque projet sous analyse souleve des sujets tout aussi complexes les uns que les autres, sujets avec lesquels les citoyens ne sont pas habituellement familiers, mais que concernent neanmoins leur santé, leur milieu de vie ou leur environnement.

2. Les clienteles:

   Essentiellement, un tel proccessus de consultation est amorée par des citoyens ou des groupes de citoyens touches par les conséquences du projet. Pour l'organisme tenant l'audience, la clientèle est neanmoins plus large puisqu'elle doit rejoindre l'ensemble de la population concernée. Au nombre des clienteles des procédures d'audience, on retrouve aussi des décideurs qui ont aussi a comprendre toutes les dimensions d'un projet, memo dans ses aspects techniques et environnementaux les plus complexes. Cette clientèle d'une audience publique a l'énorme avantage d'être très motivée et interressée a connaître et a comprendre.

3. Le contexte:

Le contexte dans lequel se tient une audience publique est concu de telle sorte que cette derniere puisse servir de processus d'apprentissage et d'echanges d'informations entre citoyens et experts, dans un contexte et un encadrement qui suscitent le questionnement, tout en permettant une discussion dans le respect des intervenants et une démarche rationnelle et posée d'analyse du projet et de ses conséquences. La disposition de la salle, la repartition des droits de parole, le rôle du président de commission et la procedure d'échanges visent a creer un climat de confiance et de réceptivité qui permette de mettre en lumière les intérêts et les enjeux liés à la décision a prendre.

4. La formule:

La formule d'information et d'apprentissage privilegiée dans une audience publique est axée sur une documentation décrivant le projet et ses conséquences, et sur le processus dynamique d'analyse et d'évaluation du contenu de cette documentation par les intervenants en présence. Une documentation en partie vulgarisée est d'abord deposée à la disposition du public interesse dans des centres d'information et de consultation, parfois en présence d'un agent capable d'aider les individus dans leur lecture des documents et recherche d'information. Puis, le projet est analysé en audience publique, notamment dans une première étape de travail spécifiquement consacrée à l'information des citoyens. Le promoteur est invité a exposer son projet et ses conséquences, après quoi les citoyens et les commissaires l'interrogent en présence d'experts qui peuvent ajouter des complements d'information ou évaluer la qualité et la pertinence des réponses apportées aux diverses questions.

5. L'approche:

L'approche d'acquisition des connaissances dans le cas d'une audience publique est très interactive, puisqu'elle est le résultat d'un échange d'informations et de préoccupations entre des citoyens et des commissaires qui questionnent d'un cotê, et des promoteurs et des spécialistes qui repondent de l'autre. Ce proccessus d'apprentissage est dynamique et est accroché au rythme et a la façon dont des citoyens non spécialement informés entrent en contact et assimilent des notions complexes, les décodant en fonction de leur situation personnelle. Cette approche devient donc tres intuitive, non linéaire, parfois émotive; une forte redondance des questions et des sujets traites permet aux individus de se familiariser très graduellement avec les sujets difficiles et nouveaux pour eux.

Une remarque s'impose cependant en terminant cette description d'une procédure d'audience publique, dans une grille de processus d'éducation a l'environnement. Mon experience de plusieurs audiences me demontre que tous les participants a une audience en apprennent beaucoup, aussi bien les citoyens que les commissaires, les spécialistes et les promoteurs, même dans leur propre domaine d'expertise et sur leur propre projet, dans le cas de ceux qui l'ont concu.

C'est là une des caractèristiques de tout processus d'éducation dite "participative". On y reconnait la valeur et la pertinence du savoir collectif, ou autrement dit du "bon sens populaire". Par leur interaction, les citoyens en apprentissage et les éducateurs depositaires de connaissances specialisées échangent leurs points de vue respectifs et leur information, au bénéfice des deux parties. Le rôle des éducateurs animant ces processus de participation est alors celui de guides dans le chéminement d'apprentissage:

- L'éducateur agit comme catalyseur du desir d'acquérir des connaissances de la part des individus a éduquer,

- il devient une personne-ressource pour stimuler et encadrer le processus d'apprentissage,

- il est responsable de l'apport des instruments d'acces aux connaissances scientifiques et techniques.

L'absence des educateurs officiels

Mais, alors que l'audience comme telle s'avere a l'usage une veritable methode d'éducation populaire en environnement, il faut peut-être s'interroger sur l'intérêt qu'y portent les spécialistes de l'éducation en environnement, éducateurs officiels ou pédagogues attitres. Car, ils sont les grands absents dans ces procédures.

Pourtant, ils auraient un grand rôle a jouer pour appuyer les citoyens désireux de s'informer honnêtement sur un projet et de participer a des décisions qui concernent leur milieu de vie et leur santé. Comment, les milieux de l'éducation pourraient repondre a ce besoin d'éducation clairement exprime par des segments bien identifiés de la population? Certaines experiences vecues fournissent des pistes de reponses a cette question.

Les institutions d'enseignement à distance, d'enseignement aux adultes et d'éducation permanente sont particulièrement bien adaptées pour remplir ce rôle d'éducation, par exemple dans le cadre de cours sur l'environnement, offerts aux adultes par le biais de formules d'enseignement à distance. Pour repondre a des besoins très spécifiques de certains groupes d'étudiants, des cours sur mesure ont été crees dans des municipalités a la suite d'une controverse dans une region ou dans une municipalité entourant les repercussions environnementales d'un projet. De tels groupes avaient des besoins très specifiques d'informations, pour appuyer leur action dans leur milieu et plus directement parfois, leur participation a une audience publique.

Au Quebec, la Téléuniversité a de cette façon fourni des services d'éducation hors des campus universitaires et sur les lieux mêmes de résidence des étudiants.[1],[2] Sous forme d'un "cours-intervention", un programme de formation sur mesure, intitule "Action-environnement" fut mis sur pied et propose a des groupes désireux de s'engager dans des projets concrets d'intervention dans le domaine de l'environnement. Les groupes qui ont beneficié de ce programme sur mesure aujourd'hui discontinué l'ont toutefois grandement apprecié. Dans certains cas, les projets ont conduit à la création d'organismes permanents ou a des formes d'actions très concretes dans les communautes d'accueil.

Encore aujourd'hui, ce besoin d'une formation sur mesure et orientée a des fin d'intervention d'individus ou de groupes dans leur milieu est très largement présent. Au-delà des formules de l'"université ouverte" ou de l'"université de la rue", des voies differentes devront être explorées pour y repondre. A l'heure actuelle, les programmes gouvernementaux d'éducation a l'environnement semblent ne pouvoir repondre adequatement a cette demande specifique de formation.

Par le biais des organismes gouvernementaux responsables des audiences publiques sur les repercussions environnementales des projets, les spécialistes de l'éducation en environnement ont peut-être une porte d'entrée pour se rapprocher de besoins très concrets de citoyens et pour repondre a une commande sociale claire en éducation environnementale. En tant que participants volontaires et autodidactes a des débats publics sur des questions environnementales souvent complexes, les citoyens intervenant en audiences publiques sont déjà très performants: les projets sur lequels ils réfléchissent et ils se prononcent gagnent la plupart du temps en qualité et en respect de l'environnement. Aux éducateurs de l'environnement d'appuyer maintenant et de rendre encore plus efficace cet effort collectif vers un environnement meilleur.

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[1]) L'environnement, bien collectif menace?, Teleuniversite, Universite du Quebec, Quebec, 1979.

[2]) Les pesticides et l'environnement, Teleuniversite, Universite du Quebec, Quebec, 1983.

MEDIA AND PROTEST

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Media have traditionally been seen as vital resources for organized social protest. Groups concerned about environmental degradation, rights of minorities and abuses of political power regularly look to media to transmit their views to the larger society and its centers of power. Such expectations of media have historically nourished the belief that media perform a "Fourth Estate" watchdog role, providing an alternative source of information that government and other institutions either do not possess or will not divulge.

Appealing as the Fourth Estate view is, it is largely a myth in terms of social structure. Newspapers, television, radio and magazines are organized agencies within an interactive and interdependent matrix, responding to centers of power in various other institutional areas. In modern society, government and business are the dominating institutions and the media are as influenced by those power centers as are other agencies. This interaction is not an even-handed exchange, since media as part of the matrix historically have been deferential to power (Curran, 1978; Boyce, 1978).

Potential subservience of American media to economic interests has been a central theme of media criticism (Hutchins, 1947). The criticism was that increasing concentration of control and dependence upon advertising were leading media to more concerns about pleasing business interests than about reporting diverse views. Warren Breed demonstrated that news reports tended to be devoid of issue that would be inconvenient to advertisers (1958). Janowitz analyzed the integrative role of the community press, avoiding conflict and reflecting rather than molding community attitudes (1952). In a Minnesota study, editors in more homogeneous communities were least likely to report controversial events regarded as disruptive to local power relationships (Olien, Donohue and Tichenor, 1968; Tichenor, Donohue and Olien, 1980).

Conflict management, in the interest of supporting authority structures has been analyzed in a number of studies. A Duke University team identified mechanisms by which print media reinforce governmental agencies (Paletz, Reichert, and McIntyre, 1971). Several investigators have delineated specific reporter techniques for "framing" stories about conflict issues in ways that appeal to mainstream values and legitimize existing power relationships (Tuchman, 1978; Molotch and Lester, 1975; Gitlin, 1980; Gans, 1979; Dreier, 1983; Fishman, 1980; Morley, 1976; Murdock, 1973; Paletz and Entman, 1981). Media reinforce the current mainstream, partly through treating groups at both political extremes as radical, illegal, unstable or morally questionable (Dreier, 1983; Shoemaker, 1984). Media typically report social movements in the guise of watchdogs, while actually performing as "guard dogs" for mainstream interests.

A Fourth Estate perspective might imply that movements center around mass media, or that media create social movements. Since media lack independent knowledge-gaining resources, and are structured to be subservient to dominant power institutions, it is inconceivable that they would initiate social protest on any major scale.

Social movements grow out of societal tensions that relate directly to central values and social power relationships. The environmental movement arose in a climate of decades-old concern for preservation of certain natural resources, alongside the question of whether modern industrial and agricultural production were threatening human health directly. As with most movements, the environmental movement in the late 1950s involved small sets of concerned people seeking to identify and articulate a problem, develop an organizational base, and establish legitimacy, often as a precondition to media coverage. It appeared as a frontal challenge to the agricultural and chemical industries and related public agencies, and did lead to a political power base and several environmental protection laws. Yet, the problem was ultimately defined by the industry and the government agencies. Even though an environmental bureaucracy with voluminous rules developed, the chemical approach to pest control remained as basic social policy. Such accommodation is typical of response to social movements by established power centers.

The Environmental Movement reflects the integral role of the mass media in accommodation of social protest. Coverage by the general mass media, such as newspapers, TV, radio and popular magazines, contributes to acceleration rather than initiation of movements. This coverage is limited, however, and highly selective. What appears in the media often overs a minuscule amount of time in the life of a movement, following the initiating activity (Strodthoff, Hawkins and Schoenfeld, 1985; Tichenor, donohue, Olien and Bowers, 1971).

Conflict in a social movement is part of social stabilization rather than destabilization. This is particularly apparent in accommodations that occur so as to minimize the threat to the system. Conflict is acted out within a controlled process, which serves as a safety value. Established groups are as concerned about preserving their power as protesting groups are about increasing theirs. While media report innovative media event strategies of protest groups, this reporting tends to over-represent the status quo and thereby reinforce it.

Conflict tends to be more routing and commonplace in structures which are more pluralistic and have a more formalized structure for accommodating it. Urban centers have wide arrays of employment opportunities, governmental agencies, political units, courts, educational resources and religious and ethnic groups. Pluralistic structures contain a variety of mechanisms for ameliorating tensions and minimizing disruption of the power relationships within the system.

Several Minnesota studies support the conclusion that leaders of established agencies and more powerful groups tend to perceive mass media as more helpful to their organizations than do leaders of less established groups (Donohue, Tichenor and Olien, 1984). Also, established leaders were less likely than citizen group leaders, individual citizens, or student group leaders, to regard the media as explicitly positive or negative.

Media role in conflict management and accommodation varies according to structure. In small and more homogeneous communities, media tend to avoid reporting of conflict that would threaten the stability of the power structure, which operates as an oligarchy and typically makes decisions by consensus. Leaders in more homogeneous communities were less likely than leaders in the less pluralistic region to agree that the local newspaper "takes the initiative in reporting controversy." Also, public affairs reports in the newspapers in the more pluralistic communities contained more controversy and their leadership was more likely to recognize a conflict role in the press. Many of the conflicts that are reported are likely to be with external agencies, such as a 1975-1978 protest against establishment of a high voltage powerline in a rural area.

Media in a protest serve both accelerating and decelerating functions. They accelerate through covering countervailing views, placing them on the public agenda, and adding to their legitimacy. Such coverage may be simultaneously instrumental to organizational goals of protesting groups and to coaptation goals of established centers of political and economic power. An analysis of a protest against a high-voltage powerline in Minnesota indicated that established powers have considerable control over the nature of that attention and the final outcome. Protests in this issue reached their highest intensity after the State Supreme Court had given formal approval to construction. Protests were then presented by the media as a last-ditch struggle that was bound to lose. Such reporting was part of a deceleration, or "cooling out" process.

Mass media are vital information resources for social protest. It is also clear that in becoming part of social controversy, the media respond as principle agents of legitimacy within the system, not as independent fourth estate watchdogs.

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THE ENVIRONMENT...A DISCOVERY

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ABSTRACT

This idea motivated a group of volunteers to create a teaching program for pre-school, primary and secondary school level children in order to develop attitudes and behaviors favorable to the preservation of our aquatic heritage.

All of the educative activities are elaborated according to the Quebec ministry of Education's apprenticeship objectives. In the primary school level, the program is centered on a two-hour nature interpretation activity. For each level, different types of activities are proposed: observation, experimentation, manipulation, problem solving. Within the framework of these activities, two naturalists guide the children in their research. They thus arouse their interest and lead them in discovering their natural environment. Before and after these outings, enrichment activities are also suggested to the teachers.

As for the pre-school and secondary levels, two video documentaries were produced in 1986. Their subjects are the impact of daily acts on the environment and the different types of pollution.

In all, since 1982, more than 8,000 children have benefited from our teaching programs and learned to discover their aquatic environment even more. Indeed, while sensitizing the youth to the preservation of the environment, we build a new socciety which, we can hope, will know how to live in harmony with nature.

The interest aroused in both the teachers and their pupils indicates the relevance of these programs. And so, thanks to our programs, we demonstrate that...The Environment is a Discovery.

L´ENVIRONNEMENT CA S´APPREND

Depuis quelques années CHARMES s´implique dans le secteur de l´éducation en offrant des programmes d´activités aux élèves de la Commission scolaire catholique de Sherbrooke. L´objectif general de ces programmes est de:

--Développer un sentiment de responsabilité face à l´environnement en suscitant des attitudes positives et des comportements favorables à la préservation du patrimoine écologique.

Pour atteindre cet objectif auprès des jeunes étudiants de la C.S.C.S., CHARMES a d´abord organisé, en 1981, des journées de plantation d´arbres sous le thème **Je construis mon environnement**. Cette activité permettait aux jeunes de poser un geste concret pour améliorer la qualité de l´environnement.

En 1982, il amorce ses activités d´interprétation de la nature en exploitant le caractère spécifique du bois Blanchard. Ce bois, situé aux abords de la rivière Magog, offre un potentiel naturel des plus enviables permettant l´interprétation du milieu aquatique et ce, au coeur même de la Ville de Sherbrooke.

La diffusion de ce premier programme est restreinte a une école, afin de roder les activités. L´experience se revèle positive et les activités se poursuivent.

En 1983, CHARMES beneficié de subventions gouvernementales lui permettant d´embaucher cinq (5) naturalistes et un (1) éducateur. Un programme éducatif pour le printemps et l´automne est alors developpé sous les thèmes suivants:

--l´environnement;
--les fleurs printanières;
--les oiseaux;
--les écosystemes;
--les maladies des vegetaux.

Plus de mille cinq cents (1 500) élèves du niveau primaire participent aux activités.

De plus, au cours de la période estivale, une pièce de théâtre est presentée au bois Blanchard pour les jeunes des terrains de jeux de la région. Au total deux mille trois cent seize (2 316) enfants sont rejoints par les activités du Comité CHARMES. C'était un départ.

Soucieux d'offrir un contenu toujours plus significatif, CHARMES developpé, en 1985, des programmes éducatifs adaptes aux objectifs pédagogiques du ministère de l'Éducation du Quebec. Un theme et des activites relatives a l'environnement immediat de la rivière Magog, sont élaborés pour les deux (2) cycles du primaire. En complément, on propose également des activités de préparation et de consolidation a l'intention des professeurs.

Diffuses au printemps et a l'automne 1986, ces programmes suscitent un intérêt marqué et soixante treize (73) groupes peuvent en beneficier. Un sondage effectue auprès des professeurs et des mille huit cent trente et un (1 831) élèves participants, revele un haut degré de satisfaction. Au cours de la période estivale, un programme d'animation est aussi diffusé au bois Blanchard. Au total, deux mille six cent trente et un (2 631) enfants parcourent les sentiers de la nature pour découvrir davantage leur environnement écologique.

En 1987, CHARMES élargit son champ d'action. En effet, en plus d'offrir ses programmes éducatifs aux élèves du niveau primaire, il est maintenant en mesure d'atteindre les élèves du prescolaire et du secondaire, grace a deux (2) nouveaux programmes. Ces programmes ont la particularité de mettre a profit une technologie fort appreciée des jeunes d'aujourd'hui, la video. Tout comme les autres programmes de CHARMES, ils ont ete developpés en conformité avec les objectifs pédagogiques du ministère de l'Education du Quebec. Complètes par des activités de préparation et de consolidation, les documents video captent l'attention des jeunes tout en leur transmettant l'information relative a leur niveau d'apprentissage.

De 1982 a 1986, CHARMES a atteint plus de huit mille (8 000) jeunes dans la région de Sherbrooke. En 1987, on peut déjà prevoir en atteindre plus de deux mille six cents (2 600). La demande est tellement forte qu'on a du embaucher de nouveaux animateurs pour y repondre.

De plus, nous ouvrirons bientôt nos portes aux autres commissions scolaires qui ont manifesté le desir, elles aussi, de profiter de nos programmes éducatifs.

Mais, qu'est-ce qui fait le charme de ces programmes éducatifs? Tel que mentionne précédemment, les programmes éducatifs de CHARMES sont elaborés selon les objectifs pédagogiques du ministère de l'Education du Quebec.

Pour atteindre ces objectifs, chaque programme est composé d'une activité majeure animée par les spécialistes de CHARMES et appuyée par des activités de préparation et de consolidation diffusées par le professeur. Au primaire, les programmes éducatifs sont axés sur une activité d'interprétation de la nature d'une durée d'environ deux (2) heures, au bois Blanchard. Pour chaque degré, differents types d'activités sont proposées:

--observation;
--experimentation;
--expression;
--resolution du problème.

Dans le cadre de ces activités, deux (2) naturalistes orientent les jeunes dans leurs recherches. Ils suscitent ainsi leur intérêt et les amenent a découvrir leur environnement naturel et ce, en pleine nature.

Les activités de préparation et de consolidation sont en fait des ateliers d'enrichissement a effectuer en classe, avant et après l'activité nature. Il y en a quatre (4) pour chaque degré scolaire du primaire. Ces ateliers sont presentes sur des fiches bien construites et faciles a utiliser. Chacune est elaborée ainsi:

--Titre de l'atelier;
--Objectifs (les objectifs d'apprentissage a atteindre);
--Vocabulaire (les mots relatifs a l'activite);
--Duree de l'activite (le temps qu'exige l'activité);
--Matériel requis (les éléments essentiels au bon déroulement de l'activité);
--Mise en situation (les idees directrices en guise d'introduction a l'activité)
--Deroulement de l'activité (les étapes à respecter pour réaliser avec succes l'activité).

Les professeurs ont ainsi toutes les données necessaires pour mener ces ateliers.

Les Nouveaux programmes du prescolaire et du secondaire sont pour leur part axes sur une dramatique ayaut pour support la video. Par une petite histoire a laquelle le jeune peut s´identifier, on demontre des gestes favorables a la préservation de l´environnement. Un animateur de CHARMES implique au prealable les jeunes par des activités preparatoires et, après la projection du video, poursuit leur apprentissage par des activités de consolidation. D´autres exercices sont aussi proposés aux professeurs.

On obtient ainsi des programmes éducatifs complets. L´intérêt suscite, tant auprès des élèves que des professeurs, demontre la pertinence de tels programmes. D´autant plus que, grace a son expertise dans le secteur de l´environnement et a son experience dans celui de l´éducation, CHARMES a acquis ses lettres de noblesse et est reconnu auprès des differents intervenants.

La mise en oeuvre des programmes éducatifs de CHARMES a ete rendue possible par des subventions de differents paliers gouvernementaux. Leur continuite est souvent tributaire de l´obtention de nouvelles subventions. Pour assurer la poursuite de sa mission, CHARMES a opté pour une tarification minimale tout en tenant compte de l´importance de maintenir l´accessibilite a la majorité.

Ainsi la Corporation de gestion CHARMES sera en mesure de diffuser ses programmes et d´être a l´avant garde dans le developpement des prochains. On prevoit d´ailleurs renouveler regulièrement les programmes afin de repondre aux nouveaux besoins du marche. Chaque année, les composantes des programmes sont ameliorées et même complètement modifiées si le besoin s´en fait sentir.

Etant implique activement dans le milieu, CHARMES est constamment a l´écoute des différentes clientèles.

En 1988, CHARMES sera dote d´un nouvel outil de sensibilisation. On l´appèlle la Maison de l´eau. Unique au Quebec, la Maison de l´eau aura pour objectif de favoriser la découverte du milieu aquatique tant chez les jeunes en milieu scolaire qu´auprès de la population en général. La Maison de l´eau nous permettra de pallier au caprice de Dame Nature.

Les programmes actuels seront adaptés à la Maison de l'eau et nous en developperons de nouveaux. Une salle de travail, une salle d'exposition et une salle de projection nous permettrons de diffuser nos programmes quelque soit la température. Nous pourrons ainsi poursuivre notre mission douze (12) mois par année.

Au fil des années, CHARMES a investit temps et énergie a l'élaboration, au développement et a la diffusion des programmes éducatifs en milieu scolaire.

L'implication de CHARMES dans ce secteur lui permet d'atteindre une vaste clientèle et d'investir pour l'avenir. En effet, en sensibilisant les jeunes a la préservation de l'environnement, on batit une societé nouvelle qui, espérons le, saura vivre en harmonie avec la nature.

CHARMES croit en ce type d'investissement et detient l'expertise necessaire pour le faire fructifier. Ainsi, grace a ces programmes éducatifs CHARMES demontre que L'ENVIRONNEMENT, CA S'APPREND!

ANTHROPOMORPHISM IN STORIES BY CHILDREN: IMPLICATIONS FOR ENVIRONMENTAL EDUCATORS

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In this paper I chose to look at one type of relationship which children have with animals--the anthropomorphic relationship.

According to the Random House dictionary the word itself comes from the Greek word "anthropomorphos" which literally means shaped like a man. The verb to anthropomorphize means "to ascribe human form or attributes to an animal, plant or material object" (Stein, 1966).

I maintain that anthropomorphism is imbedded in all our lives from the personal to the cultural level. I am anthropomorphic with my dogs, as I´m sure many pet owners are. John Livingston believes that it´s natural to be anthropomorphic. There is no other way to be. We are human so we can only see the world from a human viewpoint. Livingston (1987) goes on to say that just as we anthropomorphize dogs, dogs ´canimorphize´ humans and so on.

In one of Stephen Kellert´s studies, he questioned 267 children on their attitudes toward animals and found that "strong emotional attachment to individual animals and a tendency towards anthropomorphism, were the most typical perceptions of animals among the children studied" (Kellert, 1985).

Sectors of children´s culture such as the educational literature and the mass media use anthropomorphic representations constantly in their bid for children´s attention. In the field of Environmental Education we resort to anthropomorphism in a number of our curricula. Anthropomorphic representations are rampant in our culture as a whole. Witness the old favorites like Walt Disney´s Mickey Mouse, Bugs Bunny, and Donald Duck.

The actual definition of anthropomorphism assumes a distinct separation between the human and the non-human. Here I must part company from the accepted definition, because I do not assume that we as humans are so neatly separated from the non-human world. Erazim Kohak, in his book The Embers and the

Stars (1984), calls this a philosophy of "naturalism", which understands humans to be continuous with nature.

Neil Evernden (1987), in his recent work, has differentiated between three broad types of anthropomorphism: 1) the attribution of human form, 2) the attribution of human characteristics, and 3) the attribution of cultural abstractions.

Attribution of Human Form. This type of anthropomorphism is the most closely linked to the original meaning of the word anthropomorphous meaning ´shaped like a man´. As Evernden (1987) points out, if this physical type of anthropomorphism was wrong, "there would be no modern medicine", since most of our medical research is based on experimenting on other animals and extrapolating to ourselves.

Attribution of Human Characteristics. This type of anthropomorphism refers to the attribution of emotions or feelings to non-humans.

Attribution of Cultural Abstractions. This is for me the most dangerous type of anthropomorphism as it often masquerades as scientific objectivity. Evernden calls cultural anthropomorphism--"the attribution of a human explanation to the non-human world." For instance, we label a particular interaction between 2 chickens "dominance". Yet we don´t see dominance, all we have seen is 2 chickens chasing each other around a barnyard. The we go on to say we have discovered dominance in chickens, while we coincidentally have a theory of dominance in our society.

The Context of the Study

Through story-telling this study explored the ways in which Grade 5 students make sense of three different bear characters (a wild bear, a teddy bear and a cartoon bear), in a range of settings (wilderness, zoo, circus, home and T.V.). The analysis of the content and meaning of the children´s stories (N=38) was informed by grounded theory methodology, enthnography and literary content analysis.

Results

The most common type of anthropomorphism in the children´s stories was type #2: attribution of human characteristics. More than 70% of the children's stories represented bears as thinking, feeling, sensate subjects. Most of the bears were depicted as "LIKE-ME"; they were like the young girl or young boy telling the story. For example the bears went to school and lived with their families; they had a very similar life-world to a Grade 5 student.

As for type #1--attribution of human form to non-humans--I found the children's bears usually had bear form.

The remaining 30% of the stories dealt with type #3--cultural anthropomorphism. I commonly encountered stories where the children used popular, television/film/video explanations for life. Examples included themes and conceptions borrowed from the horror film "Poltergeist," from "Gremlins" and from the television shoe "Transformers". This illustrates the absurdity of accepting our human explanations as givens or facts, and not just as ideas. The point is those explanations are cultural abstractions.

Our grown-up cultural abstractions which explain chicken behavior as dominance are no doubt alien to most children--a state that with a few more years of schooling will doubtless be rectified.

The only other type of cultural anthropomorphism was of the entertainment variety. These were stories where the bears were portrayed as 'joke' bears who acted like stand-up television comics and whose sole purpose was to entertain the audience.

Some Implications for Environmental Educators

First of all, we know that the most common type of anthropomorphism among the children was the "LIKE-ME," attribution of human characteristics.

This discovery encourages me to pursue a more personalist/phenomenological approach to environmental education. Since the children start from the basis of LIKE ME, it's a good access point for educators to start from. For example, what do humans share with bears structurally--heart, lungs, mammary glands, etc. and then proceed to similar habits--we both eat berries and honey and climb trees. The introduction of the bear's unique aspects would follow naturally from this point.

At this point in my analysis the variable gender seems significant. The female participants had a general fear and dislike of the real bear, with a strong preference for the teddy bear. The girl characters in the stories were afraid of wild animals, especially snakes and spiders, and they often screamed at the sight of one. In the boy's stories the female characters often fainted at the sight of a real bear.

The implication for environmental educators is that we must pay attention and avoid reinforcing ungrounded, gender biased fears. We could start by encouraging young girls to explore the concept of "wildness" in order to demystify it for them. Girls are still socially encouraged to be domestic while it's culturally acceptable for boys to be a bit "wild".

The children showed an awareness of the differences between a captive and a wild animal. In their stories of captive bears (usually at the zoo), the bears longed to be free and out of a cage.

The children also showed a sound historical/contextual awareness. For instance, the children would befriend bears but then the bears would miss their own home in the woods, and the children would acknowledge this. The bears clearly had their own history, home, and preferences.

This implies to me that we could start exploring with children the differences and similarities between wild, captive and domesticated animals.

Very few children chose the wild or real bear as a character to work with and yet almost all of them persisted in telling a story about a real bear. Eventually one participant revealed why when she said that the real bear "looked like it would be hard to tell a story about."

The real bear is a "factual" bear. It's the bear our teachers tell us about and there is a fixed story line that goes with it. What a tremendous fallacy this is! We know so very little about most animals and yet at age ten children feel constrained by the real bear.

That's where as educators we can make a difference. We can start with the child's own world and extend environmental experience and reflection out from that point. Instead of always starting with the "facts" about nature, we can start with the child's own experience of the subject.

An overall implication that follows from the children's stories is that we must remember to tell our students that what we know about most animals is only a plausible story that someone else told. There is room for their stories and ideas based on their own experience. We want to nurture leaps of the creative imagination and intuitive insights. These are vital to the individual and to society at large. Creativity and intuition are often cited as the catalysts of scientific discoveries.

The stories about our relationship to nature and to other animals don't have to be fixed scripts. We are all full participants in environmental storytelling, whether we are telling the stories or listening to them.

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A PRACTICAL OUTDOOR CLASSROOM

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Land O'Lakes Senior High School
Land O'Lakes, Florida

Ecology courses are normally taught to students of a better than average ability. The concepts in ecology can, at times, require an understanding of many areas within the field of science and those students who do not posses this understanding are at a definite disadvantage. This is not to say that all students taking ecology in high school are of high ability nor do all school districts offer this course solely to a select group. In addition, ecology students have had some coursework in biology.

Ecology at Land O'Lakes, which can be taken by any student who has earned a credit in biology, is usually offered to those students who are generalized as potentially poor science students. This makes teaching advanced concepts rather difficult, however, with an appropriate strategy involving plenty of hands-on activity over the course of a school year, students develop what we want to develop in all of our ecology students--a sense of environmental responsibility.

The Campus

Land O'Lakes High School is fortunate enough to be situated on a large piece of property that represents a typical Florida wetland environment. Found on the campus are several transitional zones among differing habitats, three ponds, cypress heads, and wooded area. These areas surround the school in such a way that traveling to any one of them from the classroom can be accomplished in ten minutes or less. This makes outdoor study a regular part of the ecology course. Field trips are not necessary. Measurements and observations take place on the average of two to three times a week, interrupted only by foul weather.

Classroom/Lab

Laboratory investigations are usually conducted outdoors; however, some work with microscopes (we do have some scopes which can be used in the field) and computers must be done indoors. Lectures can be held in both indoors or out. I have found out that students with low attention spans seem to like "lectures" during a hike around the campus when the topic discussed can be observed as the "talking" takes place. Flexibility accommodates these students.

The time required to conduct any outdoor activity is targeted to be in the area of thirty minutes allowing for adequate return time to the classroom so that students may prepare for their next class. To assist students in making the most of their time in the field all equipment is either carried in five-gallon plastic containers or previously purchased in kit form. For example, water test kits are composed of several smaller individual tests as opposed to the more comprehensive testing labs. Students conduct tests in groups of two. This ensures that each team has all of the necessary equipment to conduct a test instead of waiting for equipment to be passed around.

Main Areas of Study

Although the scope of the ecology course throughout the year is extensive, the following topics and investigations associated with each give some idea as to how practical outdoor laboratories can be in complementing the classroom studies of a high school ecology course.

Ecosystem Structure. Differing habitats are examined and the basic flow of energy determined. Producers, consumers and decomposers are identified and listed. Profiles are made for both a pond and a wooded area and then compared. The idea is not only to make sure that the students realize the differences in individual species but also that they understand that structure has the same components in any ecosystem.

Activities include mapping, sketching and listing species in each structure category.

Abiotic Factors. Water samples, soil samples, etc. are analyzed with the usual test kits, however, the measurements have more impact on students when they are asked to make a determination about the area they have just sampled. For example, consider the following question, "given current EPA standards, what might you think about the quality of the pond we´ve just sampled?" Data becomes relevant and not just something to gather.

Biotic Factors. I try to use different living things for each type of determination. For instance, a particular word might be used to study distribution. Birds might be counted and used to determine abundance. In this way the students are not bored by studying the same organism for each topic. Of course these are not the only topics studied in this category.

Cycling. I feel that cycling in nature is one of the most overlooked ecological phenomena today. Throughout time man has caused one environmental catastrophe after another by disrupting some natural cycle somewhere. It is important to stress this with students and one way I demonstrate cycling is by comparing measurements when they are repeated.

A monthly analysis of a pond or stream is easy to carry out. But if this type of environment is not available, try birdcounts. Students usually like to participate in birdcounts and conducting them on campus is easy. Comparing the numbers from month to month makes for interesting graphs. I like birds because I can always depend on them. They're easy to find. In addition, comments about the different species and their numbers can be directed toward whether or not a habitat is a good one. After all a bird can easily leave a place it doesn't like.

Bird nesting is an easy cycle to study. One popular nest at Land O'Lakes is the osprey nest above the football field. The nest has been saved on a light post since it was built in 1982.

Transitional Zones. The blending of one ecosystem into another cannot be overlooked. Taking students into these areas and pointing out the diversity in vegetation mainly reinforces the need for diversity in general in the environment. The easiest zones to find are those surrounding aquatic habitats. If these are not available I suggest looking at areas maintenance people avoid in groundskeeping such as along fencelines and around poles.

The Outcome

Developing awareness in students is the goal of this high school ecology course. The awareness is based on a continual blending of outdoor lab and the classroom. In Florida the situation is such that if one does not protect the environment as it is today then development will surely eat it away.

We have lost too much in the way of endangered species and will continue to lose, not to mention the loss of resources in many areas of the state. With practical and real laboratories conducted in the environment that must be protected, students become attached to it. They do not want to lose what is theirs. They have spent too much time working in it and understanding it. Regardless of ability, any student will develop a "responsible steward" attitude to the environment if kept in touch with it.

LEARNING AS AN ECOLOGICAL PARADIGM:
FROM RHETORIC TO PRACTICE

Brian Foreman
Arbury Park Outdoor School
Bridgewater, S.A., Australia

Preamble

In recent years in Australia there has been substantial debate within the Environmental Education community as to the need to re-center education away from the teacher to the learner. This arises to a great deal from the objectives of Environmental Education and the need for participatory learning, leading to attitude development and behavioral change. The latter aspects differentiate Environmental Education from the conventional disciplines, which lack both interdisciplinarity and the aspects of personal search and sharing.

Strong objections have been put to the existing learning paradigm which is teacher-focused and which accepts that learning is prescribed, has clearly defined parameters and is contained within subjects, faculties or disciplines. Examples of a changing paradigm are being discovered in practice through examples of Earth Education and activities and programmes in Environmental Education centres.

Education as it exists now is being described as an aberration of the industrial revolution some 200 years ago, and is unlike education of previous millennium. The knowledge of natural history as well as in arts and spiritualism typified in indigenous populations, appears to have more educational integrity and relevance than the more recent education model.

Concepts of Changing Paradigms

Consistent with the educational descriptions of paradigm shift are descriptions of a need for paradigm shift in social and political terms. The educational shift is described as from the epistomological to the ecological, whereas a need for a broader paradigm shift is described as from the dominant paradigm to an alternative environmental paradigm.

There is also a shift in the area of personal philosophy as seen in alternative communities based on social paradigm shifts. This is essentially a move from anthropocentricism to ecocentricism resulting from the perception that the earth is a living organism (the "Living Planet" metaphor) as distinct from the notion steeped in religious beliefs that the human species is quite separate from the rest of the planet and had a role of dominance, exploitation and self-satisfaction at the expense of the natural processes. The Deep Ecology movement is an example of this ecocentric shift. The aims and practices of Earth Education will be elaborated here as an another example of ecocentric education.

There seems also to be a shift away from using past models because of present catastrophe, catastrophe typified by nuclear arms tension and the substantial effects of industrial pollution in our air, water and soil. The alarm over emerging facts is leading to a search for future models. The aims outlined for "green" politics in Australia include networking, imagining the future, modelling the future, direct action and communicating a message. Challenges were recently issued to the Environmental Education community in Australia to replace out-dated techniques for extrapolating a future from existing technologies, with ways of imagining better futures with other technologies and processes not seen as derivatives of current unsuccessful processes. There is not so much a need to find new answers to old questions, as to frame new questions.

Another substantial shift has been in the area of equal opportunity and typified in the successes of the feminist movement. In Australian systems of education, women are playing more prominent roles and the feminist critique is as likely to oppose the human/natural dualism as it opposes the masculine/feminine dichotomy and other dualisms such as Left/Right, war/peace, competitive/co-operative, short-term/long-term, body/soul and other old-paradigm ideas and arbitory designations.

Neither the rhetoric nor the practice in these broad shifts is new within our community, but it is particularly slow to emerge in education. The controls on education by the church and the State are so great that fringe activity rarely occurs, let alone moves towards the core of practice in curriculum. Likewise practices of the past are seen by the successful and powerful to be models for the future, so any central change to education which may be seen to be contemporary is more likely to occur in the field of computer education where high technology and market forces are dominant and existing systems are reinforced.

Greening Education

In Australia, Noel Gough has been leading the debate on "greening" education and it is not difficult for those with a keen interest in ecological processes to accept "that the environment has an informational structure at the level of objects and their casual interactions and that human perceptual systems have evolved to detect and extract that information". In other words, one of our human adaptions is the scope of intelligence to take personal messages from our surroundings and put them in pertinent context, and this implicates and educational model for society.

Gough points to fact that children beginning school bring a spatial concept of their surroundings but by the age of twelve they have developed a linear style of thinking. This reflects the difference between the accepted notions of Einstein and the rejected out-dated Euclidean models of Newton. In spite of this change in our information base, education systems have maintained artificial models to the point that knowledge has been collected and sorted, boxed up and available for delivery by arrangement with the academe. It is then the ability of the learner to successfully regurgitate the diet fed by the teacher that establishes educational prowess. Even at the highest level academic work is labelled "research" and this only serves to substantiate that the learner is going over old ground that was once relevant to someone else. The concept of a personal search is not considered a possibility.

Also implicit in the paradigm shift is the recentreing in teaching from the teacher-learner relationship to the relationship between the learner and his/her surroundings and resources. The initiating role of the teacher, and the sense of authority and power that goes with it is not central to Environmental Education. The learner/environment connections are implicit in Environmental Education.

As a digression it is interesting to observe the published information on how the left and right brains function and how many people are stronger learning through left brain processes and others stronger through right brain processes. The schooling system, to my knowledge, has never recognised this, as least not to the extent that the advertising agencies have, so learning processes are stereotypical. I further suggest, though somewhat tentatively, that women and girls may be stronger right brian learners than men and boys (for physiological reasons), and that schools have a curriculum encouraging left brain learners. This is the degree to which the narrowness of systems may discriminate either purposefully or inadvertently. There are social forces here as well, so the example will be open to question by some. My reading on the relationship between tetosterene and brain performance in Mathematics suggests there is still scope for discovery in the predominant learning styles of the sexes. I offer this in the spirit of "exploratory" thinking rather than "explanatory" thinking.

Personal Connections and Practical Learning

The most powerful argument entrenched in the ecological paradigm seems to be the notion of practical learning. Gough argues in a comparative way between practical learning and the theoretic, which is the existing emphasis in education. He also argues that what many maintain to be "practical" is in fact "technical" and he makes the differentiation between solving pertinent to the learner as distinct from those of laboratory skill development that one might find in a Chemistry lesson or in a Plastics class. He also takes strength from the recognition that Aristotle´s curriculum was one of practice and therefore gives this paradigm a longer term historical perspective.

In Media Studies for example, students often enlist because of a high degree of personal interest, a future orientation in their lives, a freedom they see to create images and stories, as well as processes of participation, analysis, collaboration and reflection.

Earth Education

There has been strong development in part of Australia of the Earth Education programmes developed by the Institute for Earth Education. This group is well known by its leader Prof. Steve VanMatre, author of Acclimatization and Sunship Earth programmes. The latter programmes have been widely used in my State of South Australia and there are now moves to develop the exciting "Earth Keepers" programme. Much inservice has been conducted by the institute in Australia over the last three or four years and almost all environmental education conferences include Earth Education workshops.

The Institute for Earth Education is a world wide network of people interested in clearly focussed, carefully crafted educational programmes that help people understand basic ecological systems, what these systems mean for them in their lives, and how they can begin making changes in their lifestyles to be able to live more in harmony with the earth and its passengers.

Their programmes reflect this in providing opportunities for personal discoveries and frameworks for exploring surroundings and making pertinent decisions for day to day living. In his observations, Noel Gough suggests that Earth Education may not have come to ecological paradigm by design as much as by simply good practice.

Where Now?

Australia is celebrating 200 years of European settlement in 1988 and as a part of the Bicentennial Australia Studies Schools Project members of the Australian Association for Environmental Education have substantially contributed to the draft of an "Australian Studies Perspective for Environmental Education". Positive outcomes of the somewhat controversial Bicentennial celebrations in Australia may be a focus on the landscape and the values which derive from that focus, along with a more practical than esoteric examination of educational practice and theory.

Discussion of the ecological paradigm is not intended simply as philosophical theorizing, but more an observation and rationalization of good practice. It is also a critique of anachronistic practice.

THINK GLOBALLY--ACT LOCALLY

Cece Forget
U. S. Environmental Protection Agency
Denver, Colorado

The U.S. Environmental Protection Agency (EPA) has renewed its commitment to working with youth to increase environmental awareness. Earth Trek is a newly revised EPA publication for elementary school students (4-6). The President's Environmental Youth Award is another effort to stimulate the interest of young people in their environment. It encourages them to participate in a project which will influence the quality of our environment and provide an environmental learning experience for the participants and others. These and other environmental education resources are part of EPA's effort to support environmental educators to foster an environmental ethic of respect for the Earth and awareness of the individual's responsibility for maintaining the balance and harmony of the ecosystem.

Together, we are working to prepare tomorrow's (in addition to today's) generation for their role of interdependent co-existence with the many and varied other forms of life residing on Plant Earth.

All of us in the field of environmental education have various methods and models for teaching. With this in mind, our session attempted, through two future problem solving exercises, to "disengage our minds," to break out of the constraints of our regular thought patterns, to expand our scope of possibilities for environmental education methods. Due to the limited time we were unable to pursue the process to a definitive vision. Nevertheless, in problem-solving, the process is the message that, I believe, was achieved by many of the participants.

How can an environmental ethic evolve through our individual and collective efforts? In addition to teaching "how can," let's consider the "what if." Future problem-solving techniques lead us beyond the search for new answers to old questions, to new questions which can generate new directions toward the unlimited potential for learning to live an environmental ethic.

THE OHIO SEA GRANT EDUCATION PROGRAM

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Origin

The National Sea Grant College Program was established by the Congress of the United States in 1966 with the goal of accelerating "the development, conservation, proper management and maximum utilization of aquatic resources of the United States." Appropriations in support of the program made matching funds available to coastal states, including Great Lakes states, for activities in basic and applied research on aquatic systems, advisory services for technology transfer to the users of the research results, and education about aquatic resources. Sea Grant Colleges therefore have a mission similar to that of Land Grant Colleges, but Sea Grant focuses on aquatic rather than agricultural resources.

The Ohio Sea Grant Program began in 1977. Research programs today capture the majority of federal funds, while an advisory service program places three agents in the Lake Erie region to respond to the needs of shoreline residents and visitors. The Education component originated in the College of Education at The Ohio State University, and is now coordinated through the School of Natural Resources by faculty from both the School and the College of Education. The program remains among the most visible of the State's Sea Grant efforts and occupies a position of national leadership in marine and aquatic education.

Need for Aquatic Education

Early research conducted by the Ohio Sea Grant Education Program tested the knowledge and attitudes of the State's fifth and ninth grade students about some key aspects of the oceans and Great Lakes. Fifth graders could answer about 38% of knowledge questions correctly, and ninth graders could answer about 48% correctly. Some questions critical to understanding and decisionmaking could not be answered by large numbers of the students. For example, only 60% of the ninth graders could correctly identify Lake Erie on a map of the Great

Lakes. Attitudes about the ocean were more positive than attitudes about Lake Erie.

Meeting the Need

Since the middle school years, grades 5-9, are critical ones in development of positive attitudes toward science and in retention of females and minorities in that field, curricula were developed for infusion into middle school classrooms. Environmental aspects of aquatic education dictate that such materials be interdisciplinary, with as much emphasis on social studies as science, and with other disciplines included as well. Therefore, the Oceanic Education Activities for Great Lakes Schools (OEAGLS) frequently begin with science lessons but apply those lessons across the curriculum.

The primary period of curriculum development was 1977-80, but new materials are still being developed to address current environmental issues and research thrusts in the Great Lakes region. Revision and updating occurs at regular intervals. In 1987 there are 26 middle school packets with a total of 78 classroom activities, and three primary grade units with a total of 160 activity pages.

Since the project began in 1977, over 25,000 copies of OEAGLS have been distributed free or at cost to educators. Adaptions of OEAGLS are in use in a diverse range of programs such as Florida 4-H, Minnesota Sea Camp and Alaska Sea Week. They have been used in teaching aquatic topics in Barbados, Nova Scotia and British Columbia.

Teacher Education

As a means of assuring the use of OEAGLS in classrooms, teacher training programs are ongoing in Ohio Sea Grant Education. Over 700 teachers were served during a three-year program of workshops statewide, and classes continue today through established courses at The Ohio State University. An estimated 1,200 teachers have been reached through these efforts. Research conducted by the program indicates that 78% of teachers in short workshops use OEAGLS, and 73% have introduced at least one other teacher to the materials.

In addition to workshops and regular courses, the faculty of the Ohio Sea Grant Education program offer courses at Franz Theodore Stone Laboratory on

Lake Erie, maintain resource centers for teachers on the campuses of OSU, Bowling Green State University and the University of Cincinnati, and offer teachers the opportunity to participate in peer training and curriculum development. Workshops are presented on request in other Great Lakes states. In 1987 these were offered by SUNY at Buffalo and the University of Wisconsin at Stevens Point.

Nonformal Education Efforts

In cooperation with the Center of Science and Industry (COSI) in Columbus, the Ohio Sea Grant Education Program offered a museum program entitled "The Great Lake Erie." The program provided resource information to 60,000 on-site visitors and then traveled to Findlay, Ohio, where another 7,500 students and community visitors learned from the program.

Research and Professional Outreach

One of the factors that sets this education program apart from others in Sea Grant is its emphasis on research and evaluation, with publications and presentations to carry results to those who can use them. For example, the program coordinator is the most published author in ERIC's category of marine education literature. Each year the program faculty extend the reach of Sea Grant and the University through presentations of research and materials at professional meetings. Leadership positions held by the program faculty are:

- -President-elect, National Marine Educators Association
- -Chairman, AAAS Education Section
- -President, Science Education Council of Ohio
- -Executive Committee, Ohio Academy of Science
- -Board of Directors, North American Association for Environmental Education
- -Editorial Boards of Science Activities, Journal of Environmental Education, Journal of Research in Science Teaching, Ohio Journal of Science.

The primary objective of the Ohio Sea Grant Education Program is to develop a public which is aware of and knowledgeable about the proper use, protection and conservation of oceans, coastal zones and fresh water resources and to motivate people to take part in decisions affecting aquatic environments. With enlightened support at the federal and state levels, this program will continue its highly acclaimed activities in years to come.

For further details on this program, including reprints of research and evaluation articles, contact the author at the OSU School of Natural Resources, 2021 Coffey Road, Columbus, Ohio 43210 USA.

QUEBEC PROVINCIAL PARKS, ACTIVATORS IN ENVIRONMENTAL EDUCATION

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ABSTRACT

In 1977, the Quebec Government adopted the Parks' Act. Since that time, a good number of trends have been designed towards specific subjects for parks in Quebec. Environmental education is one of them. Many means, original and adapted to present day realities, were developed to meet the needs of visitors staying in these protected areas (hikers, rowers, cross country skiers, school groups, etc.). This presentation includes a brief introduction to the Quebec parks network, a summary of trends adopted in terms of environmental education and some examples of performance measures used in Quebec parks.

QUEBEC PROVINCIAL PARKS, ACTIVATORS IN ENVIRONMENTAL EDUCATION

Le Quebec présente une histoire prèsque centenaire pour ses parcs, puisqu'en 1894, le parc de la Montagne Tremblante est crée et l'année suivante, c'est au tour du parc des Laurentides. Dans les années 30, deux autres territoires sont venus s'ajouter. En 1977, le gouvernement de la province adopte sa loi sur les parcs et y reconnait deux (2) types de parcs, les parcs de conservation et les parcs de récreation. Les premiers, les parcs de conservation, sont crées pour assurer la protection permanente de territoires représentatifs des regions naturelles du Quebec ou de sites naturels a caractère exceptionnel et sont rendus acessibles au public pour des fins d'education et de récréation extensive. Les parcs de récreation quant a eux ont pour mission de favoriser la pratique d'activités récréatives de plein air dans un environnement naturel protegé. On compte actuellement 10 parcs de conservation, 5 de récréation et un autre en voie d'être reconnu dans la categorie des parcs de récréation.

La vocation éducative des parcs se manifeste aujourd'hui de plusieurs façons en incitant d'une part les visiteurs a cotoyer, connaitre et comprendre la nature et d'autre part, a leur permettre de développer leur propre conscience envers la conservation de cette nature. L'éducation au milieu naturel repose alors sur une thématique propre au reseau de parcs et véhicule entre autres les modes de gestion des ressources naturelles dans ces territoires. Les moyens utilisés, en plus d'être simples et attrayants, s'adressent a tous les visiteurs des parcs et une attention particulière est accordée aux clieutèles d'age scolaire.

En plus des activités traditionnelles, animées ou non par du personnel (exemples: les randonnees accompagnées par un naturaliste, l'animation dans les centres d'accueil, les causeries, les depliants et panneaux d'auto-interprétation, etc.) certaines activitées particulières ont ete presentées: jamborée de la faune, randonnée en rabaska, jeux et pièces de théatre éducatives, diner-causerie, théatre de marionnettes, rallye-nature. Pour chacune de ces activités particulières, une brève description des messages, des clientèles visées et des moyens employes a été esquissée.

Les parcs du Quebec contribuent donc directement a l'éducation relative a l'environnement en sol québècois.

INFUSING ENVIRONMENTAL EDUCATION INTO THE ELEMENTARY SCHOOL CURRICULUM THROUGH LOCALLY DESIGNED RESOURCE KITS

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Fredericton, New Brunswick

Although many teacher would like to infuse environmental education into the public school curriculum, they are faced with pressure to teach the existing curriculum through the provincially endorsed texts and materials. Little time is left to review and integrate the multitude of environmental education resources that are available. In response to this stumbling block, two environmental education resource kits, one dealing with energy and another with pollution, have been developed. They attempt to coordinate New Brunswick curriculum guides and texts for grades 4-6 with environmental education resources gathered from a variety of sources including Project Wild, Project Learning Tree, and The Class Project. Since environmental issues need to be approached from a holistic perspective that consider a variety of influences and viewpoints, these resource kits integrate the subjects of science, social studies, language arts, mathematics, physical education, health, art, and music as much as possible. The various activities and resources help develop the theme and move students from an initial stage of environmental awareness to the development of healthy attitudes and responsible behavior.

To help a teacher move students from awareness to action and choose activities appropriate to their particular class, the activities in the resource kits have been color coded and sequenced in the following manner: activities and lessons that will help develop awareness are color coded blue; activities that bring out society's interactions with the natural environment are color coded red; and activities that investigate social issues and problems, that encourage students to become actively involved, are color coded green. A movement through each of these levels will help prepare students to critically examine environmental issues and take appropriate action. We have tried to incorporate three methods of study: outdoor inquiry, simulations, and case studies. These should provide a variety of learning experiences and encourage critical thinking and problem solving skills.

An outline is provided for those teachers who wish more direction in using the resource kits. This outline structures the activities and can be used as much as desired. Since many of the activities explore various energy or pollution topics, a teacher with limited time can choose a variety of activities from each section to create a unit that corresponds with their particular time schedule. The advantage of the integrated approach of these resource kits is that the activities lend themselves to a unit that emphasizes science, social studies and language arts. In this way more time can be allowed for an in depth study.

The developers of this kit recognize that it is only a beginning. To further their impact the kits should be used in conjunction with personal resources and modified according to each teacher's professional needs. In this way they will enhance the curriculum and promote the growth of a holistic environmental ethic.

Energy Kit Goals

Activities and resources included in this kit help students identify and investigate the characteristics of renewable and nonrenewable energy sources in New Brunswick and Canada. Students are encouraged to become more conscious of their consumption habits, and to work toward more efficient practices.

In the realization of these goals students will be exposed to the following big ideas:

--Availability of energy sources varies with location.

--There is a cost involved in producing energy whether it be economic, technological or environmental.

--Individual efforts to conserve energy are needed to help solve our energy problems.

--Soft, renewable forms of energy are less threatening to the environment and so hold the most promise for the future.

By keeping these ideas in mind and integrating as many subjects as possible into the activities, teachers can provide students with very meaningful environmental learning experiences, while promoting a more positive approach to energy consumption in the future.

Energy Kit Concepts

Energy Sources

- --Fossil Fuels
- --Hydroelectric Power
- --Nuclear Energy
- --Solar Energy
- --Wind Power
- --Tidal Power
- --Geothermal Energy

Energy Conservation

- --At home
- --Travelling
- --At school
- --Recycling

Pollution Kit Goals

Activities and resources in this kit help students identify and investigate various sources of pollution in New Brunswick and Canada. Students are encouraged to become more aware of their own habits, and ways they can contribute to cleaning up the environment.

In the realization of these goals students will be exposed to the following big ideas:

- --Our life styles and habits often result in or contribute to the pollution of our environment.
- --It is impossible to throw anything "away." Natural cycles in the ecosystem such as weather patterns, ocean currents and the water cycle often transport dangerous materials so they show up in other places, often in hazardous concentrations.
- --If individual and community action is not taken to stop pollution, our health and safety will be endangered.

By keeping these ideas in mind and integrating as many subjects as possible into the activities, teachers can provide students with meaningful environmental learning experiences while promoting more conscious antipollution attitudes, behaviors and actions.

Pollution Kit Concepts

Litter
Hazardous Wastes
Garbage
Air Pollution
Acid Rain
Noise Pollution
Water Pollution
--water use/waste
--sewage and chemicals
--ground water contamination
--oil and the oceans

FROM JOINT ADMINISTRATION TO ONE ADMINISTRATION: NEW CHALLENGES

Benoit Gauthier
Sainte-Foy, Quebec

As a non-government organization working to bring the public greater awareness of the environment, the Linnaean Society of Quebec has, since 1979, lived through several important challenges in the area of administration and interpretation. We will present an account of these recent experiences which will be of help to other organizations in their work and provide a stimulus for future developments relating to natural history museums and related facilities.

Several examples will be cited: a) The Linnaean Society works in close collaboration with a provincial government department on the site of the Quebec Aquarium; b) Two distinct federal government agencies on two different sites are cooperating with the Linnaean Society to conduct experiments on new approaches to joint management; c) The Linnaean Society is associated with private enterprise to develop three tourist operations on the river below Quebec.

PORTRAIT ORGANISATIONNEL DE LA SOCIETE LINNEENNE DU QUEBEC

Introduction

La Societe linnéenne du Quebec est une societé sans but lucratif dediée a la conservation de la nature et a la vulgarisation des sciences naturelles. En raison de son intense implication depuis plusieurs années dans des dossiers majeurs au Quebec, elle peut être considerée aujourd'hui comme un organisme provincial.

Trés peu d'écrits s'attardent a l'aspect purement organisationnel des societés sans but lucratif. Nous essayerons donc d'apporter notre petite contribution en nous servant d'une societé que nous croyons typique et exemplaire a plusieurs points de vue.

Du local au provincial

La Linneenne fut fondée en 1929 par un petit groupe d'éducateurs et de chercheurs chevronnes des villes de Quebec et de Levis. Pendant une trentaine d'années, elle regroupe tout au plus une cinquantaine de membres autour de son activité principale, les conférences. Au cours de cette période, c'est souvent le secrétaire qui est l'élément stabilisateur de l'organisme. La Société est alors considerée comme étant d'une envergure avant tout locale.

La situation change radicalement en 1959 lorsque la Société accepte de jouer un rôle actif a l'Aquarium de Quebec en matière d'éducation. Le Gouvernement en demeure le gestionnaire principal, c'est-a-dire qu'il voit au maintien de l'immobilier, a la préparation et au suivi des exhibits vivants et a la promotion des lieux. Afin qu'elle remplisse adequatement sa mission, on octroie a la Linneènne les concessions du comptoir souvenirs ainsi que celui du restaurant. C'est a partir de cette époque que la Linneènne devient un organisme surtout régional. Six administrateurs voient, sur une base benevolé, a son entière administration dont celle principalement de gerer une dizaine d'employes. Toutefois, a partir de 1965, le nombre d'administrateurs est rehaussé a 12 afin de repondre aux besoins sans cesse plus nombreux dont ceux des membres qui excedent dorenavant les 200. Puis en 1970, la Société en arrive a engager son tout premier gerant mais sur une base du demi temps. Les revenus ne permettent pas encore qu'il en soit autrement.

Cinquante ans après sa fondation et vingt ans après son entrée a l'Aquarium de Quebec, soit en 1979, la Linneènne se tourne resolument vers le rayonnement externe de l'institution gouvernementale; elle met le cap sur le Saint-Laurent en organisant notamment les fameuses croisières aux baleines. Elle y mettra tant d'entrain et de professionnalisme qu'en quelques années, elle atteindra le statut d'organisme provincial. Pour refléter ce nouveau dynamisme, elle change son appellation en 1981 pour devenir la "Societe linneènne du Quebec" au lieu "... de Quebec".

De nos jours, la Société regroupe près de 900 membres et est active sur quatre sites d'interprétation autre que celui de l'Aquarium de Quebec. Cinq employes y ont leur "permanence" et plus d'une quarantaine y travaillent sur une base occasionnelle. A ceux-ci s'ajoutent a l'année longue plus d'une cinquantaine de bénévolés. Afin de mener a bien ses nombreux mandats, la Societé a du se doter d'une structure organisationnelle particulière. Nous jeterons un coup d'oeil intéressé sur cet aspect fort dynamique.

Equilibre entre benevoles et employes

De 1929 a 1970, l'ensemble de la Linneènne du Quebec repose entre les mains des benevolés. Le président, l'executif et le conseil d'administration y detiennent donc-tous les pouvoirs. Le modèle est on ne peut plus simple (figure 1), sans pratiquement de structure hierarchique. Les opérations et comités sont alors sous la résponsabilité d'un administrateur ou de plusieurs, selon le cas. L'homogeneite de l'equipe est vite atteint et l'éfficacite depend pour beaucoup de la disponibilite et de l'habilite des individus. La venue d'un employe regulier a demi-temps (gerant(e)) de 1970 a 1983 ne change guère cette structure organisationnelle. Par ailleurs, le volume d'activités et d'opérations tend a s'accroitre regulièrement.

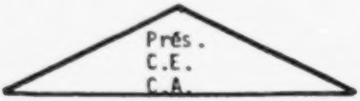


Figure 1.

En 1983, le poste de gérant a demi-temps est conservé[1] mais on y ajoute un poste regulier a temps plein; il aura alors pour titre de "secretaire général". Ce dernier doit seconder le conseil d'administration dans toutes ses entreprises qui ne cessent de s'allonger: plus de 15 comites ad hoc. On lui confie également la tache de voir aux opérations telles celles reliées a la mise sur pied de la Halte cotière de pointe Noire. Le role des administrateurs benevolés reste encore tres grand et indispensable car les activités croissent un peu plus rapidement que les revenus. Sans etre rémunere, le président se consacre a sa tache pour ainsi dire a temps plein. Nous pourrions illustrer l'organisation qui prevaut par un triangle maintenant complètement inverse quant a la portion des administrateurs et une figure, en partie bicephale, au niveau des employes (figure 2).

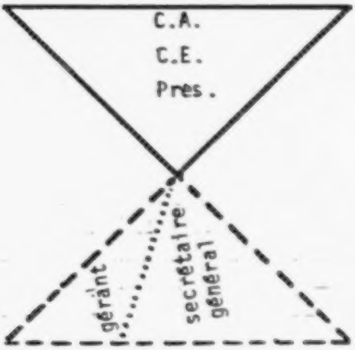


Figure 2.

La reprise en main des croisières sur le Saint-Laurent en 1985 oblige les administrateurs a proceder a une reforme organisationnelle en profondeur. On profite du prêt d'une personne inscrite au programme gouvernemental "Formatcadres" pour creer le poste de directeur général et transformer celui de secrétaire général en celui de directeur général adjoint. Le risque est important: nous confions un tres grand pouvoir a une personne fort nouvelle dans notre organisation et qui plus est, en stage pour une seule année. Neanmoins, celle-ci prend en charge quasiment toutes les operations de la Linneènne du Quebec en particulier la ou la Société est liée par contrat et la ou elle a des employes:

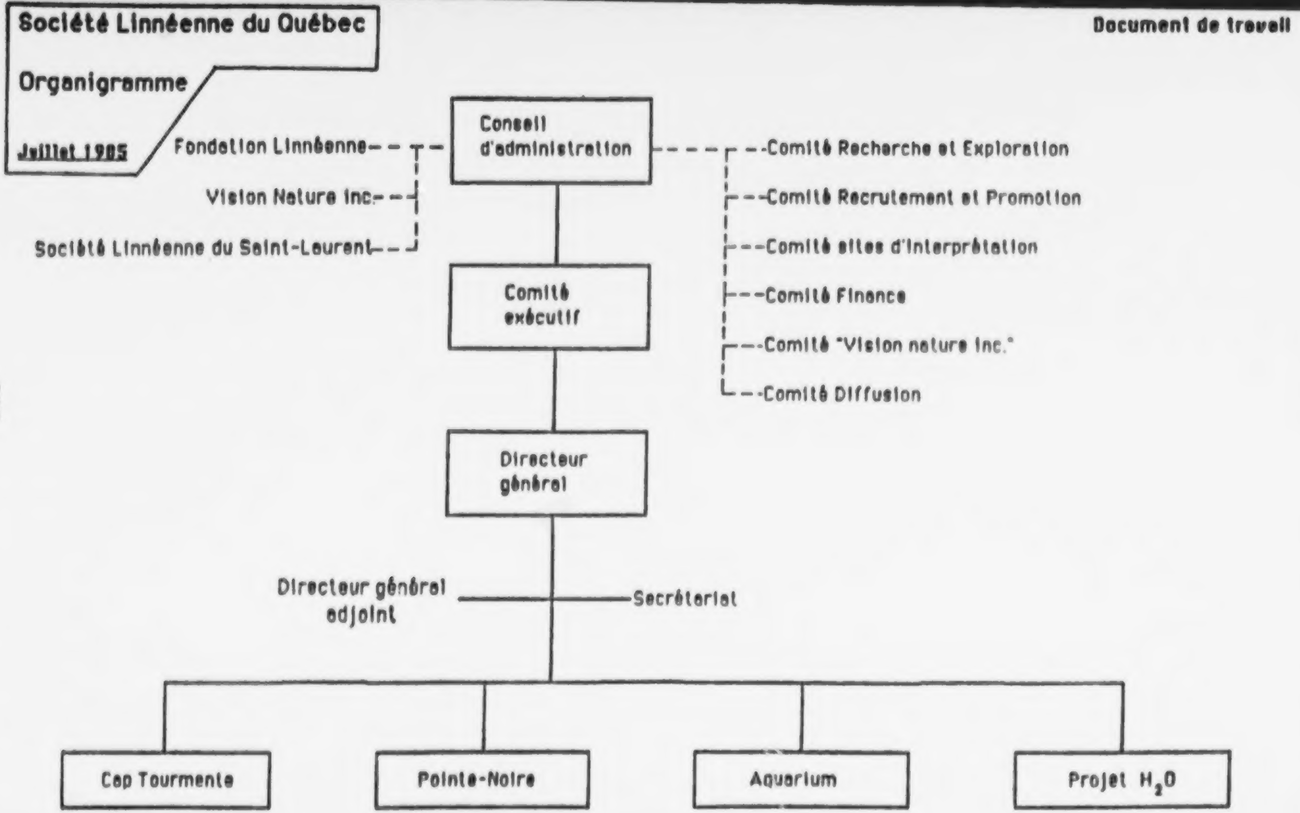
--Aquarium de Quebec
--Reserve nationale de faune de Cap Tourmente
--Halte cotière de pointe Noire
--Croisieres d'interprétation sur le Saint-Laurent.

Du coté des benevoles et des administrateurs, l'ensemble des activités est regroupe essentiellement en quatre grands comités, connus presentement sous la designation de:

--Comité Recherche et Developpement
--Comité Sites et Interprétation
--Comité Promotion et Diffusion
--Comité Gestion des Ressources.

La figure 3 illustre l'organigramme de 1985. La reforme s'arrête ainsi, bien avant d'avoir complètement defini les équilibres entre les bénévolés et les employes. A cause de cette problematique, oubliée ou non resolue par les reformistes, la Societé entre dans une periode ou les tensions vont être elevées et les difficultés de fonctionnement nombreuses.

Un an après le debut de la reforme, nous en arrivons neanmoins a un bilan d'ensemble positif. Aussi, la majorité ne souhaite pas de modification a la structure organisationnelle. Il est également decide de reprendre un autre stagiaire de "Formatcadres" comme directeur general. Cette fois, le personnel en place et les administrateurs impliques vivent mal les changements de style et d'autorité et nous voila contraints de mettre fin a ce stage des son mimandat. Le travail reste volumineux et la situation économique demeure fragile. Dans cette situation plus que complesée, les administrateurs engagent une simple coordonnatrice, sans pouvoir reel sur les employes, et abolissent les postes de directeur général et de même que celui de directeur général adjoint pour le reste de l'année (figure 4). Ainsi, le desequilibre entre les benevolés, les administrateurs et les employes, dont les charges de projets, ne peut aller qu'en s'accentuant. En réalité, apres seulement quelques mois, un comite special doit etre mis sur pied et travaille présentement a illustrer plus finement l'ensemble de la structure et le fonctionnement de la Linneènne du Quebec. On n'a plus le choix, il importe maintenant d'achever rapidement la reforme amorcée en 1985.



Société Linnéenne du Québec

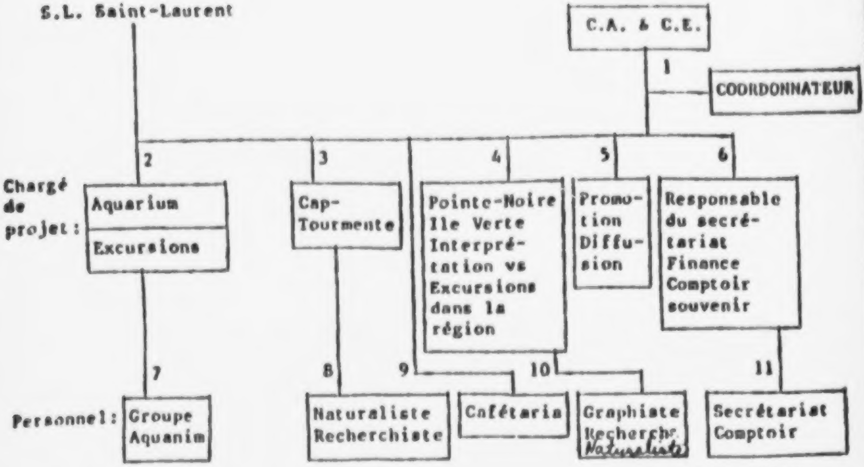
Organigramme

Juillet 1985

Document de travail

Conseil d'administration
Fondation Linnéenne
Vision Nature inc.
Société Linnéenne du Saint-Laurent
Comité Recherche et Exploration
Comité Recrutement et Promotion
Comité sites d'interprétation
Comité Finance
Comité "Vision nature inc."
Comité Diffusion
Comité exécutif
Directeur général
Directeur général adjoint
Secrétariat
Cap Tourmente
Pointe-Noire
Aquarium
Projet H2O

Figure 3.


S.L. Saint-Laurent
C.A. & C.E.
1
COORDONNATEUR
2
3
4
5
6
Chargé de projet :
Aquarium
Excursions
Cap-Tourmente
Pointe-Noire Ile Verte Interprétation vs Excursions dans la région
Promotion Diffusion
Responsable du secrétariat Finance Comptoir souvenir
7
8
9
10
11
Personnel:
Groupe Aquanim
Naturaliste Recherchiste
Cafétaria
Graphiste Recherche Naturaliste
Secrétariat Comptoir

au 5 octobre 1987

Figure 4.

De la cogestion a la gestion

Plus que n'importe quel autre organisme quebecois voue aux sciences naturelles et a l'environnement, la Linnéenne du Quebec est bien présenté sur de nombreux sites d'interprétation. Cinq au total, repartis le long du Saint-Laurent entre Quebec et Tadoussac, soit sur une distance d'environ 140 km.

Les partenaires y sont on ne plus diversifies:

Ministère du Loisir, de la Chasse et de la Pêche (gouv. provincial) : Aquarium de Quebec

Parcs Canada (gouv. federal) : Halte Cotière de pointe Noire

Service canadien de la faune (gouv. federal) : Réserve nationale de la faune du Cap Tourmente

Entreprise privee (bateliers) : Croisières sur le Saint-Laurent

Societé de conservation de la Baie de l'Ile Verte (Societe sans but lucratif) : Ile Verte par le Large

Les formules contractuelles avec les gouvernements y sont fort variées allant de la cogestion partielle (Aquarium du Quebec), en passant par la cogestion régulière (Cap Tourmente), jusqu'à la gestion pleine et entière (pointe Noire). Avec l'entreprise privée, la Linnéenne offre de multiple services allant de la formation du personnel jusqu'a l'association économique. Quant au dossier de l'ile Verte, la Linneenne en assume le leadership promotionnel et organisationnel quoique sur le terrain, son role debute au point d'embarquement et s'arrête sur l'ile Verte, ce dernier endroit étant pris en charge par la Societé de conservation de la Baie de l'ile Verte.

De nouveaux défis

En optant pour développer son coté entrepreneurship au début des annes 1980, la Linneenne du Quebec est entrée dans le groupe des PME (petite et moyenne entreprise) du Quebec. Elle est sans doute la plus importante des organismes sans but lucratif parmi ceux qui visent la mise en valeur des aires de conservation de la nature. C'est donc dire qu'une expertise sans égale, de nature non gouvernementale, s'y developpe. Voila certes une dimension non négligeable lorsque l'on connait les politiques avouées des gouvernements tant fédérause que provinciause qui consistent a laisser a l'entreprise privée des equipements museologiques d'intérêt collectif.

Dans les prochaines années, on peut penser que la Linneenne va s'attarder a améliorer sa performance sur les sites actuels, a y consolider sa presence, a mieux s'organiser dans le but d'atteindre notamment des degrés d'autofinancement plus élevés. Par exemple, la Société a entammé des pourparlers pour devenir le seul gestionnaire de lAquarium du Quebec. C'est la un defi de taille qu'elle se declare prête a relever. Nous sommes donc très loin des années 30 et 50; la Linneenne a bien grandi! Pour cet équipement et pour bien d'autres, il conviendrait que l'Etat mette en place des mécanismes de cooperation qui soient stimulants plutôt que remplis de méfiance et lourds de contraintes administratives.

Pour relever avec succes tous les défis qui se présentent encore à elle, la Société linneenne dispose d'atouts incontestables qui, a l'instar de bien des entreprises, résident dans la qualité du personnel permanent, occasionnel et bien sur, bénevolé. Son rayonnement recent tient dans la centaine de personnes très actives qui y collaborent, il resulte egalement du haut degré d'innovation rendu possible grace aux divers cercles (comités) de qualité qui y prospèrent. Si la Société parvient a maintenir son personnel bien en place, a le faire tendre vers des objectifs communs et a le stimuler vers la réussite, il est probable qu'elle pourra continuer a grandir au Quebec dans un domaine qui est bien le sien, la conservation des ressources naturelles et leur mise en valeur.

[1] Le gérant doit voir au bon fonctionnement du comptoir souvenirs (7 employés) et de quelques comités réguiers (Ex. Club du Livre).

WINTER LODGE

Bob Gingrich
Oglebay Institute
Wheeling, West Virginia

> "Teach your children that whatever befalls the Earth befalls the sons of the Earth...This we know--the Earth does not belong to man, man belongs to the Earth...Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself".
>
> Chief Seattle (1854)

Winter Lodge is a two-day, one-night program developed for the fifth grade students. It has also been used successfully with Cub Scouts, Indian Y-Guides and Princesses, and with fourth grade students.

The program is a combination of outdoor nature studies and Native American studies. The uniqueness of the program stems from the combining of education techniques and principles with the use of dramatic technique.

The ingredients for the outdoor nature study are the natural areas around our Nature Center and our knowledgeable staff. The dramatic ingredients include the stage setting of a snow-covered tepee with smoke drifting out the flaps, the focusing power of our shared fire as we encircle it, and the smell of wood smoke. The presentations inside the lodge have elements of suspense and anticipation from the silence as the fire builder prepares the fire to the slow unveiling of the earth bundle as the symbols are explained. A bonding is achieved as we share the fire, the food, the discoveries, and finally as they are presented their friendship bundle.

Concepts of Program

- --Humans are dependent upon animals and plants, and we are all part of a sacred circle of life.
- --The quality of human lives is affected by the conditions of plant and animal tribes.
- --Winter is not a "dead season" or a season to avoid exposure to nature.

--Native Americans are real people with inventive ideas, a sense of fun, of humor, an understanding and philosophy on the human's place on earth.

Description of Program

Students arrive at the A. B. Brooks Nature Center accompanied by their classroom teacher(s) and sometimes parent volunteers. After quickly storing their gear, they are prepared by a staff member for their first visit to the Lodge. Preparation includes explaining how to signal the Lodge, how to enter, and about respect for the Lodge Master. After all are seated in the Lodge, a fire is kindled using flint and steel. Then the Lodge Master explains that the wood, rock, and metal can work only when brought together with the knowledge of the fire builder. This emphasized the need for knowledge and is the purpose of Winter Lodge--to gain knowledge of our world in winter. The Lodge Master then shows the students an "earth bundle". He explains that "earth bundles" contained certain objects, that if treated properly and with respect, would bring good fortune to the owners of the bundle. The Lodge Master opens the bundle and explains the contents.

The bundle is red wool bound with blue and white ribbons and a wooden hoop wrapped with brown yarn. The blue ribbons represent the earth's waters, all the water that ever was, all the water there will ever be.

The white ribbon represents the air, all the air that ever was, all that will ever be.

The wooden hoop wrapped in brown represents the earth and the circle of life. Everything in the bundle is bound up by this circle of life and by the air, the water, and the earth.

When the bundle is opened, it contains representatives of all the tribes on earth, the no legged, one legged, two legged, four legged, six legged, eight legged, and the many legged. The tribes of day and the tribes of night. Those that produce, those that consume. The hunted and the hunter.

The Lodge Master explains that as long as we respect and see that the tribes represented in our bundle thrive and do well, so we will thrive and do well. If we forget or treat our bundle with disrespect, we will all suffer.

The group is then sent on their first outdoor study. It is called "Winter Lodges" and is about where and how animals and plants live and survive in winter. When they return from exploring the forest area, they eat lunch. Before beginning lunch, they are asked to think about where their food has come from.

After lunch, during a sit down rest time, Native American artifacts are explained to the students. Emphasis is placed on the Indians´ need to make all of their own equipment needed for survival and on their ingenious use of natural materials at hand and their artistic sense of proportion and decoration.

The next outdoor exploration is to a pond or stream where samples are gathered and brought back to the Nature Center for examination. Each student has his own sample and equipment for searching the pond or stream water for living creatures. A collection of these discoveries is shown on a micro-projector. Discussion centers on the stage of development and type of creature along with observing how the animal moves, gets oxygen, takes in food, and how it defends itself. All creatures are put back into the pond or stream water and the hike to the pond or stream to return the samples concludes the session.

In need of a change of pace, the students are now introduced to a variety of Indian games. Depending upon the snow cover or lack of it, they play snow snake and have snow boat races or play shinny, or a tug-of-war type game along with the quieter hand games.

Just before the evening meal, students have a period of teacher led time that is for journal writing or recreation or walks.

The evening activities include a night walk to help overcome fear of the outdoors at night and to discover night vision and the sounds of the night. Upon returning from the night hike, the group enters the Lodge and gathers around the fire for a session of story telling. After an evening snack, preparations are made for sleeping overnight in the Lodge. Wood is carried to the Lodge, the fire screen put in place around the fire and sleeping spots are chosen. Anyone who lacks parental permission or who chooses to may stay in the Nature Center. If someone decides to move from the Lodge into the Nature Center during the night, they are free to do so. However, most stay through until morning when they have a dawn hike to see the sunrise. After breakfast, they have a program on birds and it is held in conjunction with a banding of live birds. This allows students to hold and see the birds closely and to release them when they have been banded.

To summarize their experience, the students prepare a "winter count", a pictographic representation of what they have done. The "winter count" is done on a stretched hide with each student adding a part to the "count". Gear is prepared for the trip home and then lunch is served.

Following lunch the group goes to the Lodge for a final session. They enter quietly and wait for the Lodge Master to speak. He praises them for the good things he has seen them do, he encourages them to remember what they have learned about the tribes of earth and how we will depend on the others that live on this earth. To help them remember, he gives each student a piece of cloth so they can make their own friendship bundle.

The students depart to the bus and classroom teachers are given evaluation forms.

Background

The A. B. Brooks Nature Center, like many centers, struggled to get meaningful participation during the months of January, February and March. Numerous programs and events were offered with limited participation, limited educational outcomes, and limited cash flow. Many of the nature study components of Winter Lodge were offered free to school and the public with few takers. Reasons given for not participating revolved around the difficulties of arranging bus transportation and the unsureness of weather that may cause a school delay, early dismissal, or cancellation. Other reasons included lack of funds for field trips (in our case, $1.25 per student) and a state mandate that held trips must relate to curriculum.

The overnight limitation was dictated by our facility. There is no kitchen and no showers. A temporary kitchen with propane stoves and refrigerators for storage were brought in and a quick and easy menu established. The menu included a dinner, breakfast and a lunch. Students bring a bag lunch when they come.

The evening meal leans toward American Indian and is a stew with a beef or poultry base, adding corn, hominy, lima beans, onions and beans. A side dish of sweet potatoes and walnuts cooked in maple syrup was also served. These are new foods to many students but for the most part, the teachers approve of this experiment in eating.

Meal preparation is kept simple but is important in the packaging of our program. When we tell schools that Winter Lodge is a total package that includes meals, instruction, lending library, school site visit, and all supplies, they find the cost of $26.50 per student to be reasonable. People seem more willing to pay for tangibles such as food, supplies and equipment than they are willing to pay for intangibles such as instruction and program. In developing this program we focus on the needs of our consumer. We wanted to make it easy for them to participate by dovetailing with their schedule, eliminating organizational chores such as providing food.

This allows the classroom teachers to use their efforts to blend this into their instruction plan rather than spending time on organizational duties. We support them in classroom activities via a pre- or post-experience lending library, pre-trip staff visit, and structured activities that can be taken back to the classroom.

Allowing teachers to teach rather than organize has won us many supporters.

Part of our success comes from the staff's specialized knowledge, but equally important is the authenticity of the stage setting. Few school systems would go to the time and expense of setting up a functional tepee with authentic accouterments; yet they appreciate the value of this staging. Winter Lodge is a blending of educational techniques with dramatic techniques in a participatory area.

For a typical schedule, equipment list, sample evaluation sheet, and samples of poetry done by the students, contact the author.

ENVIRONMENTAL EDUCATION: THE SUM OF GEOGRAPHY AND BIOLOGY? OR MORE?

Ad Goedvolk
SLO (Science Department)
Enschede, The Netherlands

Introduction

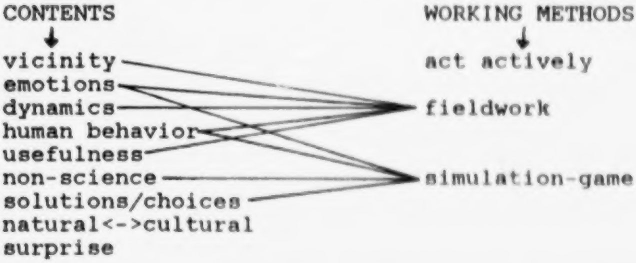
During the last few years I have been involved in the design of a new integrated curriculum "Science Education for 12-16 year olds" (geography, biology, chemistry, and physics). This curriculum is developed through the drafting and testing of teaching-learning units in collaboration with teachers. I would like to present one unit as an example.

The theme "Soil, kill it or cure it" aims at increasing environmental awareness. It is designed for 14-year-old students at all types of schools.

What was the origin of this design?

As stated before: the team of designers (curriculum developers and teachers) formulated its important aim as follows: "increasing environmental awareness."

We started to define the term "environmental awareness" by formulating conditions that could increase awareness:


CONTENTS
vicinity
emotions
dynamics
human behavior
usefulness
non-science
solutions/choices
natural<->cultural
surprise
WORKING METHODS
act actively
fieldwork
simulation-game

EE in the school and at the national level

The experiences with the theme "Soil, kill it or cure it" are exemplary for environmental education in traditional subject-structured education. I shall now devote some attention to the school and the national level.

The School Level. The limits of the traditional school subjects appear to be irrelevant and troublesome. They are irrelevant because of the interdisciplinary character of environmental education; troublesome because most of the teachers are trained to teach only one subject.

Besides subject-directed teaching, the school curriculum should also consist of environmental education projects that cover more than one subject. This implies that teachers of geography, biology, science, chemistry and economics need some retraining in each other's subjects. This retraining has begun in The Netherlands. Since 1972, teachers for the education of 12-16-year-olds have been trained in two subjects. An important part of this training is developing teachers' ability to apply methods such as fieldwork, simulations and lab lessons.

The National Level. "Didactics of environmental education" must be developed. Besides the methods, special attention should be paid to the selection of the contents, planning, development of values, relationships between attitude and behavior, and to teaching about relationship networks and ecosystems. In this respect, I think that the "Strathclyde-model" of the Scottish professor Smyth deserves our attention.

Strathclyde	Soil: kill it or cure it
1. Observation	1. Observation
2. Analysis --evolution --inter-connections --elements of change	2. Analysis
3. Views on guidance of change	3. Synthesis on a case-study
4. Fields of knowledge --natural world --social world --technology --decision-making	4. Views on guidance of change

Reflections on the aims of environmental education continue. Do we wish to achieve "better environmental behavior" or do we aim at "increasing environmental awareness?"

Should environmental education goals be among the aims of formal education?

Maybe television series, peer group, parents, and youth clubs have a more important task in this respect. Education and social institutions will have to tune in to each other´s activities.

The essence of EE

Environmental education is *not* just adding geography and biology together, although the contents and methods of these subjects play leading parts.

In my opinion, environmental education does not deal exclusively with environmental problems, but with important paradigms such as the hydrologic cycle within the ecosystem and with people´s impact on these networks. Therefore, it is necessary to pay attention to human systems of values, and decision-making processes.

EXAMPLES OF PROBLEMS AND SOME SOLUTIONS IN EE CURRICULUM DEVELOPMENT

Frits Gravenberch
Nieuwegein, Holland

Over the last year, staff members of the Dutch National Institute for Curriculum Development (SLO) together with experienced teachers, teacher trainers and others were engaged in an integrated science project for 12 to 16 year olds (NO 12-16) as well as in activities of Dutch pilot schools of the European Community Environmental Education Network (ECEEN).

Regarding the NO 12-16 project the development of a program proposal and teaching materials on soil as well as recommendations regarding the characteristics of EE-type teaching materials (produced by a so-called study group) will be discussed.

The program proposal resulted from a more or less systematic procedure, starting from achievement objectives that were derived initially from the project groups' general aims and objectives. Using the procedure, also resulted in a scheme which gives an insight in the kind of concept maps the pupils are expected to develop as a result of the integrated science course. The developers of teaching materials on soil, in particular, put much effort in designing didactic means to improve pupils' environmental awareness.

Comparison of literature on EE was used as a starting point for the development of recommendations for the development of EE-type teaching material. In particular recommendations regarding characteristics of EE-type materials according to specific aims and objectives will be discussed.

Regarding the ECEEN, we will give an overview of activities as curriculum developers and teachers, engaged in the preparation of an implementory phase of the ECEEN results. Characteristics of a so-called teacher guide as well as some background of its development--as a result from the specific experiences from the contributors--will be discussed.

In particular, differences--as a result from the different composition together with the kind of responsibilities curriculum developers e.g. teachers had--in types of curricular products produced by the various taskgroups, will be discussed.

ACTIVISM IN THE NORTHWEST: SURVEYING THE EFFECTS OF PUBLIC RELATIONS ON CONFLICT RESOLUTION

Larissa A. Grunig
University of Maryland
College Park, Maryland

Environmentalism threatens to erupt once again into the consciousness of this nation. Public relations practitioners are the spokespeople chosen most frequently to contend with the demands of activists who oppose their organizations on a number of critical fronts: acid rain, timber resources, groundwater pollution and nuclear energy. Implications of the survey data presented in this paper should help them deal more effectively with the myriad special interest groups challenging them directly and indirectly, through both the mass media and government. The study also serves as a benchmark in helping chart the course of activism and organizational response over time.

The literature suggested several reasons for today's resurgence of environmentalism. First, the Republican administration put environmentalists out of public office and back into activist organizations. The Reagan White House also has curtailed governmental regulation and encouraged energy development--both of which are targets for environmentalists. These activists are more powerful than their predecessors of the early 1970s primarily because they have learned to form coalitions and to lobby the government directly and through enlisting grassroots support.

Reviewing the literature also indicated that organizational responses to activist pressure have changed. Organizations have become more militant, they rely more on public relations to help resolve environmental confrontations and the public relations to help resolve environmental confrontations and the public relations practiced is more strategic. Some articles in the trade press also contended that the typical relationship between organizations and environmentalists has shifted from competitiveness to interdependence.

Because most of the literature reviewed does not come from the scholarly journals, it lacks the theoretical framework that would lead to hypotheses.

Instead, it provides a descriptive base that suggests the following questions and assumptions.

How extensive is environmentalism in this country? How successful is the typical activist group? How successful is the organization in dealing with the group? What are the correlates of success in each case?

Factors that presumably affect the success of an environmental pressure group include its size, resources, independence or involvement in a coalition, tactics and media coverage. Variables that seem to affect success on the part of the organization include the anticipation of issues; cooperation among public relations practitioners, other organizational members and the activists; level of responsibility; development of strategic plans and programs; media coverage; public awareness of the dispute; evaluation of effectiveness; type and size of the organization; size and budget of the public relations department; and demographics and professionalism of the public relations staff.

A telephone survey of nearly 200 public relations practitioners throughout the Pacific Northwest was conducted to answer the questions and support or disconfirm the assumptions listed above. Interviewees represented governmental agencies, corporations and associations. Following the data that described this stratified random sample, correlational analysis and discriminant analysis identified variables associated with success of the typical activist group or success of the target organization.

About half of all respondents indicated that they had experienced the pressure of environmental activism recently. Consumer service organizations and governmental offices were the most frequent targets of activism. The interactions between public agencies and activist groups tended to be the least successful for the organization.

Across organizations, though, respondents indicated that pressure groups prevail more often than they lose in environmental disputes. Further, environmentalism dominates as the concern of activists in general.

Activists' tactics ranged from the innocuousness of direct mail campaigns to the violence of dynamiting power lines. Mild forms of protest, especially letter writing, predominate.

However, the most visible tactics are more effective than the sub rosa approach inherent in telephoning, writing letters or circulating petitions. About half of the activist groups described were part of a larger group (state or national) or coalition of groups.

Respondents characterized the environmentalists' stance toward them as "hostile" close to half of the time. However, the less hostile the posture of the activist group, the more successful the organization tends to be during the controversy.

Organizations adopt a variety of approaches to countering this external opposition. The most effective response is a responsible one that may include incorporating environmentalists in the organization's planning process or placing one of their leaders on the board of directors.

Preparedness is another key determinant of organizational success. Organizations with standing committees dedicated to dealing with any activism fared better in actual disputes. Although disagreement may not be avoided entirely, the interest group's stance tends not to harden into hostility.

Initial cooperation with activists also might preclude their resorting to public displays of disaffection with the organization--actions that engender media coverage. Publicity alone may not be enough to influence public opinion in any significantly negative way, but it may have an interactive effect with the lobbying that environmentalists also practice so effectively in 1988. In other words, law-makers and regulators may be influenced by what they hear of an organization through the green lobby but also through their grassroots constituents. Together these forces of the public and protestors may lead to an unfavorable resolution for the organization.

Budgeting for public relations (including allocating funds regularly for outside expertise in a PR firm) and conducting research on the pressure group both increase the organization's chances of success in coping with activism. However, most respondents knew little about the group that was opposing them; they could not answer questions about the group's leaders, source of funding, primary concerns, etc.

Surprisingly, professionalism of the public relations practitioner decreases the likelihood that the organization will prevail. Longevity of the practitioner in the organization, though, is a significant predictor of organizational success in dealing with environmentalists.

Although most respondents believed the mass media had treated the conflict fairly, almost half would have preferred less coverage. Organizational interaction with the media typically took the form of informal conversations with reporters, followed by writing news releases and hosting press conferences.

Media attention to the dispute between organizations and activists helps create the community knowledge of an environmental dispute that often leads organizations to respond more quickly and more openly than they would in obscurity. Thus they are almost forced to act responsibly.

Only rarely, though, does the organization change its policies or even develop new programs in response to environmental activism. Of the few organizations that did, the most common approaches included meeting with the group, forming mediation committees, mounting an informative or persuasive campaign and training staff in how to respond. Activists are involved in planning these responses about half of the time.

Slightly more than half of the organizations sampled evaluated the effectiveness of whatever response they chose to cope with environmentalist pressures. Using a clipping service was the most common method, followed by (in order of frequency) interviewing members of the activist group informally, internal discussion with top management, interviewing members of the general public informally, conducting formal surveys, reviewing correspondence, debriefing of the team charged with dealing with the environmentalists and "word of mouth" within the community.

Finally, the study is perhaps as important for what it did not as for what it did uncover. For example, the way in which a person practices public relations (whether managerially or journalistically) has little obvious effect on the outcome of interaction with environmentalists. The number of people working in the public relations department, too, has little impact. Although about half the activist groups described were part of a group of groups, this affiliation affected the outcome very little. Further, media coverage is incidental to other, more important factors--such as involving the activist group in the programs that the organization develops to deal with the issue, the pressure tactics the group adopts and in particular, the organization's level of responsibility toward the group.

Implications of the study include the need for the astute agency or business to consider hiring the kind of individual best capable of working cooperatively with activists: one with enough education to understand the need for research and with the training and experience to conduct it. Research is important for several key reasons. Most respondents indicated that they knew little, if anything, about the activist group before the controversy erupted. When they did investigate, they relied on informal means such as the grapevine and media coverage. Any even quasi-scientific research tended to be evaluative, rather than formative. That is, the typical public relations practitioner measured his or her effectiveness after the fact, rather than conducting research to help in the planning process. The effective public relations practitioner also would be willing to look at any environmental issue from at least two points of view and would appreciate the potential of communication for the necessary sharing of information and of attitudes.

INDO-U.S. CHILDREN'S ENVIRONMENTAL EDUCATION TELEVISION PROJECT

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Introduction

India is today engaged in an enormous development effort. Over the last decade, programs have been initiated in India to bring environmental considerations into development plans. For these programs to be successful, widespread understanding of the environment and people's impact on it are essential. Environmental consciousness, sensitivity and values need to be inculcated in early childhood education.

While the educational potential for television was realized in India very early, no major effort at using this powerful medium for environmental education has been made. In 1987, the Centre For Environment Education in Ahmedabad, India (CEE) and the State University of New York College of Environmental Science and Forestry, Syracuse N.Y. (CESF) began a three-year cooperative project to develop a 26-part television series targeted at middle school children in India. Each TV program will be part of a module supported by a booklet for the teacher with background information, lesson plans and student activity materials. Teacher training in environmental education is also a part of the project.

Kartikeya V. Sarabhai, Director of CEE, and David L. Hanselman, Professor of Environmental Communications/Education at CESF, are co-principals of the project. Edward J. McCrea of The U.S. Fish and Wildlife Service (FWS) is the Project Officer. Current financial support comes from FWS, the U.S. Agency for International Development (USAID), CESF, and the Government of India. The Science Office of the U.S. Embassy in Delhi coordinates U.S. participation.

Each module (TV program to fit a 30-minute TV broadcast slot plus classroom and field activities) will be developed topically, arranged around themes such as biological diversity, endangered species, water resources, forestry and deforestation, and pollution abatement. The modules will be designed so that students will be able to apply the lessons and explore them in class or on their own.

In addition, the project offers international environmental education experience for college students in both nations. Currently six graduate students--three from India and three from the U.S. are working on M.S. degrees at CESF. To complete the degree, each student will work full-time on the project for six months at CEE.

The project takes place in two 18-month phases. Phase one allows for setting the curriculum and testing various methods and formats. With the diversity of Indian geography, cultures and languages, making each module universally exciting and relevant becomes a real challenge to educational innovation. Project staff are now completing an "essential learnings database" which will be the foundation for curriculum development. (These 700 learnings will be published and available for distribution in July, 1988). Another phase one task has been an extensive review of children's educational television programming. These findings will also to be published in 1988. Phase one will conclude with the production of one or two complete modules ready for appropriate field testing.

Phase Two, which is expected to start in June, 1988, is the production phase during which 11 or 12 more programs will be developed, tested, revised, and prepared for national distribution. The remaining 13 modules will be developed subsequent to the testing of the first 13 productions.

Project Description

The Following specifications have been developed for the project and provide and overview of project activities. (See also graphic summaries at the conclusion of this paper.)

Context

Each video is to be developed as a component of an environmental education module which consists of a teacher training program, teacher guides or lesson plans, student activity materials and the television program. The teacher guides and video may be used independently, but the integrated use of both is designed to be additive and synergistic.

Number of modules

During phase one (January, 1987-June, 1988), themes for a series of modules will be developed and one or two will be produced and undergo preliminary evaluation. Phase two (June, 1988-January, 1990) will generate another 11 or 12 modules and the first 13 will be field tested. If funding permits, a second 13 programs series will be developed and field tested.

Length of each video

Twenty-three minutes (i.e., to fit a 30-minute TV broadcast slot).

Target audience

Middle school children in India. Age group 10-14. Rural and urban.

Primary use

In classrooms as an integrated part of an instructional experience led by the teacher and with student participation activities. Television program delivery by broadcast or non-broadcast video recording.

Secondary uses

Broadcast to homes during children's viewing time. Non-school video cassette distribution.

Language

Each video will be planned and produced so it can be released in a language appropriate for the region of use without re-filming. Initial production and field testing will be in Hindi. (An English dub will also be made for demonstration.)

Subject area

Environmental concepts and issues. Each module (and hence each video program) will have a unifying theme. While the series will reflect the diversity of regions and cultures, each module (print and non-print materials) will be relevant any place in India.

Project Team Leaders

Executive Producer. CEE Staff. Coordinates video writing and production with Episode Producer and Curriculum Development Coordinator. Assures series continuity within format guidelines and responsible for maintaining high production values.

Episode Producers. (One per show) Contracted or CEE Staff. Will work at CEE during production. Overall supervision of story research, script writing and episode filming and editing. Will consult with Curriculum Development Director on content and objectives. Responsible to Executive Producer. (It is assumed that an Episode Producer will undertake three to six shows.)

Curriculum Development Coordinator. CEE Staff. Responsible for working with Executive and Episode Producers in coordinating instructional content between video and print materials. Supervises development of teacher and student print materials.

Instructional objectives

The environmental themes and learning objectives will emanate from the collaborative efforts of the project team. As work on each episode begins, the Episode Producer will be given:

- --The program theme
- --The geographic (or political) region for telling the story
- --Specific cognitive and affective objectives to be developed in the program.

There will be give and take as print and non-print components develop. Coordination throughout development stages with frequent reviews of treatments, scripts and drafts will be integral to the process.

Format

Each program will employ a "magazine" format. But this does not imply a strict "formula" for how component stories will be told, whether or not the individual sequences are interwoven or discrete. These decisions rest with the Episode producer in consultation with the Executive Producer.

There will be common titles and intro/close music to establish series identity and continuity.

Some devices (e.g., puppet characters) will be developed and appear in opening and closing segments.

Development considerations

Must be meaningful and relevant throughout India (I. e., although each modules will be filmed in a particular State or region, the message itself is for all India and cannot be regionally biased in content or format).

Must be able to be issued in several language versions.

Although the programs comprise a series with an intended sequence of use, each program must be able to stand along (i.e., not be fully dependent on preceding programs). The products are additive. That is, there will be educational benefit in just viewing the TV program, or in just engaging the (print) classroom lesson plans. But ideally, when both are used together, a higher level of learning obtains.

Production Facilities

Production will be centered in Ahmedabad with location filming as necessary. CEE will develop limited in-house video staffing and facilities and will contract for additional production and technical support (e.g., final editing). While Episode Producers will engage certain outside creative specialists, in-house facilities and talents will be used where appropriate.

It is hoped that this unique Indo-U.S. collaboration will serve as a model program for international environmental education, and that many of the products may be adapted for use in the United States and other nations as well. By aiming environmental lessons at India's children, the project has the potential to benefit all nations by creating a citizenry that is environmentally literate and motivated to participate in solving existing environmental problems and preventing new ones.

For additional information, contact either of the project Co-Directors:

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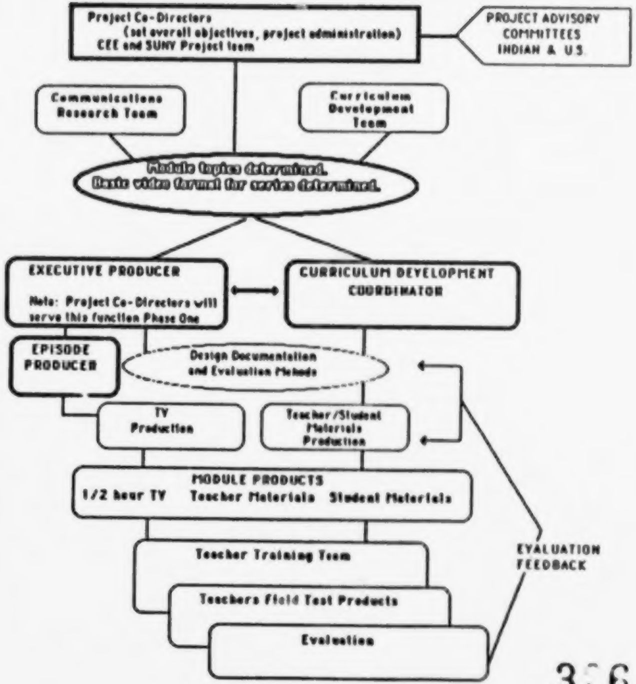
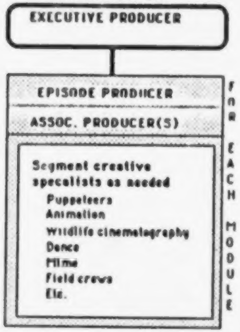
Syracuse, NY 13210 U.S.A.

Project Operations


Project Co-Directors
(set overall objectives, project administration)
CEE and SUNY Project team
PROJECT ADVISORY COMMITTEES INDIAN & U.S.
Communications Research Team
Curriculum Development Team
Module topics determined.
Basic video format for series determined.
EXECUTIVE PRODUCER
Note: Project Co-Directors will serve this function Phase One
CURRICULUM DEVELOPMENT COORDINATOR
EPISODE PRODUCER
Design Documentation and Evaluation Methods
TV Production
Teacher/Student Materials Production
MODULE PRODUCTS
1/2 hour TV
Teacher Materials
Student Materials
Teacher Training Team
Teachers Field Test Products
Evaluation
EVALUATION FEEDBACK

TELEVISION PROGRAMS

PRODUCTION


EXECUTIVE PRODUCER
EPISODE PRODUCER
ASSOC. PRODUCER(S)
Segment creative specalists as needed
Puppeteers
Animation
Wildlife cinematography
Dance
Mime
Field crews
Etc.
FOR EACH MODULE

FORMAT

Opening: Common titles and music theme

Introduction: By common puppet characters in a common "magic room" setting

Body: Magazine format with or without a story running throughout. May or may not employ the common puppet characters.

Conclusion: Return to puppet characters in "magic room" for summary. May bring real/puppet experts.

Closing: Common titles, theme.

PRODUCTS to be

Partially sequenced (able to stand alone, but at best used in a sequence)

for

School children in middle grades and/or children viewing at home

of

Half an hour (i.e., fitting 30-minute TV time slot)

using a MAGAZINE format with open and close titles, music theme and introductory device common throughout series. Middle portions may be a story which weaves through various situations and locations or employs segments held together by central figures.

Situational formats may be

Story-telling
Quiz
Case Studies
Documentary
News
Demonstration
Drama
Dance
Interviews
Folk forms

with

Puppets
Actors
Real People
Wildlife
Animation
Specialist

and

Presenter(s) onscreen (or offscreen after visual identification onscreen)

Story content based on

Science
Current events
History
Futuristic
Fantasy
Mythology
Folk stories

Primary language Hindi but dubs to other languages to be possible without re-shooting. (English version for professional audiences.)

TETON SCIENCE SCHOOL AND THE GREATER YELLOWSTONE ECOSYSTEM: A SUCCESSFUL APPROACH TO BIOREGIONAL ENVIRONMENTAL EDUCATION

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Teton Science School
Kelly, Wyoming

The Importance of Bioregional Thinking

"Bioregionalism" is a new social movement that seeks to redefine human society--and our resulting sense of place--along the lines of natural ecosystems or "bioregions" (Dodge, 1981). This paper addresses two related, but different ideas: 1) That the introduction of bioregional or ecosystem thinking in environmental education curricula is increasingly important and possible; and 2) taking advantage of bioregional ideas can greatly enhance the effectiveness of an EE organization.

"Bioregion," as used here, refers to a region that is "of a piece" biologically and is approximately synonymous with "ecosystem." Bioregions possess measurable similarities in climate, topography, geological substrata, and hence, biological diversity (plants and animals). These differences set one bioregion apart from neighboring biogeographic areas. Few show absolute boundaries or are closed systems. The term "bioregion" is less rigorous than "ecosystem." "Ecosystem" was coined by Tansley (1935) to describe interacting systems of living things, together with their non-living habitats (Cox, 1969; Odum and Odum, 1959). In either case, bioregions and ecosystems grade one into the other across a series of subtle boundaries or ecotones.

For example, the Greater Yellowstone ecosystem (GYE) (Camenzind, 1985) is defined as "the high mountainous region centered around Yellowstone National Park and surrounded by dry regions" (Congressional Research Service, 1986:342). The surrounding dry regions, the Basin and Range Province to the west and the Great Plains Region to the east, are similarly unique.

We all live in bioregions, whether the Piedmont of the southeastern United States, the Great Lakes Basin ecosystem, or the GYE. While the boundaries of bioregions can rarely be exactly defined, the concept nonetheless gives rise to a powerful possibility: If we can come to identify our place with a naturally occurring bioregion or ecosystem, we are far more likely to provide for its protection and wise use. Naming gives life and identify to ideas as readily as it does to things.

Living with Ecosystems

Landscapes are composed of boundaries both real and imagined, whether completely human (urban) or entirely natural and wild (with and without humans) (Nash, 1976). Boundaries result from natural barriers such as rivers, mountain ranges, or continental edges, while others are the result of political expediency; human imposed demarcations that invariably fragment natural ecosystems (Harris, 1984; Wilson, 1988). In contemporary America, this has led to a pattern of land ownership and administration having little or no direct relationship to functioning ecosystems or natural communities (Congressional Research Service, 1986; Clark, 1987). The resulting fragmentation and insularization of habitat units, and corresponding loss of biological diversity, is a world-wide problem that touches all human beings (Wilson, 1988).

As we become an increasingly urban and mechanized society, we have less contact with natural landscapes. Direct knowledge based on actual experience, as in a farmer with the land, becomes ever rarer. People identify their occupation and place of residence with a given city, township or state--all human constructs--and less with natural places and systems ("I live in Teton County," rather than "I live in the Upper Snake River Valley"). Thus, the connection between personal actions, often small and seemingly insignificant, and their incremental effect on a local, let alone bioregional basis, is missing.

Lacking is the critically important--and difficult to grasp--Public awareness of the functional unit of the landscape itself: the ecosystem. Americans have historically viewed landscapes as "scenery," rather than as interconnected organisms and systems, some visible (flora, fauna and geography) and many that are not (biogeochemical cycles and energy flow). The successful preservation of biological diversity, the Earth's 10 to 30 million organisms, including humans, is dependent on the protection of functioning ecosystems (Wilson, 1988). If human cultures and economies are to be sustainable for the long-term, they must be integrated with healthy ecosystems.

In the Northern Rockies the widely accepted reference to the 12 million acres surrounding Yellowstone and Grand Teton National Parks as "the Greater Yellowstone ecosystem" (GYE) is having a major impact on land management thinking (Clark, 1987). Management coordination in the GYE has come about through pressure exerted by an informed public--a public that increasingly identifies its home, and its sense of place, as the GYE.

Of what value is the bioregional concept to environmental educators? A review of the Teton Science School (TSS) and its recent history will reveal the connection.

Environmental Education: A Bioregional Emphasis

Much of TSS's success is undoubtedly due to location, but an analysis of the school's history reveals something more. For the first 15 years, TSS had an annual budget of less than $100,000 and a professional staff of 3 people. It was thought of as a local school with an excellent program, principally identified with Jackson Hole and Grand Teton National Park.

Seeking a wider audience for its programs and message, and a solution to the problems of staffing and fundraising typical of small organizations, the staff and Board of Directors in 1983 revamped the structure of the School. A model of organization based on the bioregion to be served, the GYE, was adopted. By consciously attaching the school's public image to the GYE, it "annexed" the citizens living around the two National Parks--as well as anyone else in the United States concerned with the Yellowstone area.

Careful development of the school's first 5 year operating plan revealed needed increases in staffing, budgets, fundraising, and new buildings. An analysis of program revenues revealed that growth would allow for a larger staff with better pay, benefits and working conditions. With these changes, an older, more experienced staff and a reduction in turnover could result. While annual fundraising would increase over time, the percentage that fundraising contributed to each year's operational budget would actually decline; the percentage coming from student tuition--earned income--would increase. Annual fundraising increases would be off set by a larger population to draw from--those concerned with the preservation of the Greater Yellowstone ecosystem. While our programs always had a bioregional flavor, additional programs were planned to incorporate this new thinking. Increased efforts in regional recruiting were planned. In short, the entire organizational plan was restructured to successfully accomplish these goals over five years.

The results are revealing: The professional staff has grown from three to ten and is among the best paid of all non-profit environmental education organizations. In the past five years, TSS has raised 2 million dollars, mostly through private giving, from a region of half-a-million people. The facility has been renovated with the addition of new buildings. Over the past three years alone, enrollments have doubled (with waiting lists), and new and innovative programs have been added. The school reaches an even more diverse audience with more programs, ranging from primary school groups, to six-week intensive high school courses, to training for resource professionals. And all of this despite being located in a region known for its harsh weather and physical isolation from major population centers. As the only year-round environmental education program in a lightly populated region, the school plays an important role in shaping the region's self image. Not coincidentally, the Science School's growth has paralleled a growing public awareness of the Greater Yellowstone ecosystem concept.

While not all organizations are fortunate enough to be located in the GYE, all educators live, by definition, in bioregions. Building a program around the concept of a bioregion can provide direction and continuity in programming and organizational structure--a metaphor for the entire organization. It can also provide a larger identity for a program that is viewed as "merely" local, thereby effectively increasing the audience size, which has repercussions in fundraising and student recruitment. Most importantly, you can broaden the public's sense of place--where they are in the landscape--to include an ecosystem or bioregion; a way of thinking that becomes increasingly more important with every passing day.

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TVA--A WORLD OF RESOURCES

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Introduction

"TVA--A World of Resources" curriculum is an educational program designed to provide junior high school teachers and students the opportunity to interact with the natural and cultural resources of the Tennessee Valley. The program investigates the environment as a whole and the affects that changes have on individual resources. The program stresses the interrelationships among resources, ecosystems, and resource management.

Activities in this program are action oriented and designed to blend into existing science, social studies, and in some cases, mathematics curricula.

The activities are designed to draw from the students the concepts of interdependence, change, adaptation, energy flow, and diversity.

Program Description

"TVA--A World of Resources" is designed to teach students in grades 6-8 about resources management.

"TVA--A World of Resources" units include: air, cultural, energy, forest, recreation, water, and wildlife resources and an overview on how TVA integrates the management of these resources.

This program is designed to be flexible and provide students and teachers with "hands on experiences" in resources management. Activities can be presented in any number of sequences since there is no set order of study for the units or for particular investigation. Each unit can be studied in depth or activities from several units can be combined to focus on a specific issue.

The interrelated nature of the program requires that factsheets from several different units be used as background information for individual activities. This is because individual activities are designed to show how the management of one resource can significantly affect the quality and use of other resources.

How To Use This Curriculum

This curriculum was designed so that teachers could examine various environmental issues with their students. The following are two examples of how teachers could use this material to develop a unit for their classroom on a current environmental issue.

Question: How Does Groundwater Become Contaminated?

Factsheets

Air: Hazardous Pollutants

Forests: Benefits from the Forest

Water: Overview
Groundwater--The Hidden Resource
Pollution--Natural and Manmade
Precipitation--The Start of the Cycle
Water Quality--How Clean is Clean?

TVA: Agriculture
Environment and Natural Resources

Activities

Air: Storing Hazardous Materials

Water: Aquifers and Artesian Wells
Aquifers Underfoot
Modeling the Mississippi Embayment
Modeling the Injection Well
Modeling a Toxic Lagoon
A Natural Filter

Question: What is Acid Rain and Why is it a Problem?

Factsheets

Air: Overview
Urban Air
The Burden of Pollution
Acid Rain: An Air or Water Problem?

Energy: Energy and the Environment

Forest: Benefit from the Forests

Water: Pollution--Natural and Manmade
Precipitation--The Start of the Cycle
Water Quality--How Clean is Clean
Surface Waters--The Visible Resources

Wildlife: Wetlands Wildlife
Wildlife Habitat

TVA: Environment and Natural Resources

Activities

Air: The Atmospheric Blanket and Winds
Weather Cycle
Atmosphere Watchers

Forest: The Forest Blanket

Water: The Super Cycle
Weather Watchers
A Natural Filter

Wildlife: Mind Mapping

TVA: Maintaining the Web

Using this as a guide, you can pick and choose to develop your unit. For instance, I have decided to devote three days to groundwater.

Day 1 Introduce Topic: What is Groundwater?
Factsheet: Water Overview and
Groundwater--The Hidden Resource
Activity: Modeling the Mississippi Embayment and/or Aquifers Underfoot

Day 1 How Does Water Become Groundwater?
Factsheet: Precipitation--The Start of the Cycle
Activity: A Natural Filter and/or Aquifers and Artesian Wells

Day 3 How Does Groundwater Become Contaminated?
Factsheet: Pollution--Natural and Manmade and Water Quality--How Clean is Clean?
Activity: Modeling the Injection Well and/or Modeling a Toxic Lagoon

Summary

It is the ultimate goal of this educational program to develop a conservation ethic in students in the Tennessee Valley. It is our aim to help ensure that "future decisionmakers" in the Valley are equipped with a basic understanding of natural systems and can use this information to make knowledgeable judgments on difficult resource-related issues.

NOTE: This curriculum is currently available nationally through the ERIC/SMEAC system. To obtain a copy contact: ERIC/SMEAC, 1200 Chambers Road, Columbus, Ohio 43212-1792.

USING ECOLOGY RESEARCH DISPLAYS
AS A TOOL FOR ENVIRONMENTAL ISSUES EDUCATION

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Introduction

The information which scientists generate to explain the complexities of human impact upon terrestrial and aquatic ecosystems becomes fuel for public debate during the formation of environmental policy. Yet, the disciplined procedures which scientists employ to create this knowledge are unknown, or at best remain mysterious, to most members of the general public and to policy makers. People selectively use scientific information to suit their emotional or economic impulses without rational assessment of the validity of the scientists' knowledge claims. If scientific information is to contribute to public policy formation, all decision makers within a democracy should have the opportunity to understand how this information is gained.

Ecology Research Displays

The Institute of Ecosystem Studies (IES), an ecological research and education center which is a division of The New York Botanical Garden, is addressing the need to develop public insight into the scientific research process. One of the IES education programs, Ecology Research Displays, uses displays and display programs about environmental matters of public concern to teach ecological concepts and research processes. Three of the themes explored in the IES Ecology Research Displays are: acid rain impact upon ponds; ambient ozone effects on plants; and the disturbance, recovery and management of plant communities. Funding for the development of these projects has been provided by the Natural Heritage Trust and by the Mary Flagler Cary Charitable Trust.

The following discussion outlines how one of the Ecology Research Displays, the Acid Rain Study Ponds, is used both as a display for casual visitors and as a resource for a variety of guided programs.

Acid Rain Study Ponds

The Acid Rain Study Ponds demonstrate a method of experimental manipulation of aquatic microcosms which scientists could use to complement basic monitoring and analysis of natural ecosystems. The research question which the study ponds experiment addresses is: Do aquatic microcosms with quartzite bedrock respond differently to simulated acid precipitation than aquatic microcosms with limestone bedrock?

As with all of the IES Ecology Research Displays, the Acid Rain Study Ponds are set up outdoors on a scale functional for both research and education. The study ponds are sixteen, 100 gallon tanks containing pond microcosms: pond water, bedrock, plankton, pond macrophytes, fish, snails and aquatic invertebrates. These "mini-ponds" are set into the ground within a 117 square meter area of a field, are surrounded by a snow fence, shaded by tobacco cloth and interpreted with signs and brochures located within the fenced area.

Eight of the tanks contain quartzite as their bedrock, and eight contain limestone. Four microcosms of each bedrock type are treated with simulated acid precipitation (10% H_2SO_4). The remaining eight tanks serve as controls and thus do not receive the artificial rain. The treated and control tanks of each bedrock type are distributed randomly within the 16 tank grid. Interpretive signs and brochures as well as staff-led activities emphasize that randomization, replication, controls and precise data collection and analysis are important safeguards for ensuring valid experimental results.

Visitors to the Acid Rain Study Ponds participate in data collection and/or review data previously collected and displayed on charts. The data collected on each microcosm are: pH, dissolved oxygen, temperature, numbers of living and dead snails and fish, plankton and invertebrate species and abundances, and aquatic plant size and health. A part-time staff research assistant also monitors the tanks once a week during the May through October season to maintain the data chart on display.

In addition to the focus on experimental methodology, several display components are under development to teach scientific concepts (e.g., a "do-it-yourself fizz test" to test for buffering reactions in bedrock samples from a variety of regions) and to link the study ponds to the issue of acid rain (e.g., a model illustrating the typical geology, topography and location of regions acutely sensitive to acid rain). For school and adult groups participating in a guided display program, films, discussions and activities help to extend the display's potential for teaching science concepts and issues awareness.

The Eco-Issues Program

Understanding the methods scientists use to delineate correlations and causations, and learning basic ecology, earth science and chemistry concepts contribute to our ability to analyze environmental issues. However, people who are to take on responsibility for society's resolution of environmental issues need support and education which go beyond this foundation. Within the public realm, scientific findings can be selectively or incorrectly reported, or even disregarded. Even when scientific information is used appropriately, this information forms only part of a complex drama in which political, business and personal behaviors are equally important players.

The Institute of Ecosystem Studies is developing a framework for a six-week environmental issues unit for high school students, incorporating the resources of the Ecology Research Displays. This program, Eco-Issues, currently targets the tenth grade students in New York State who are not in the college preparatory scholastic track and are thus receiving their last formal exposure to science.

Students participating in the Eco-Issues program examine current environmental issues, learn fundamental science concepts, analyze the science/technology/society fabric and develop "enabling" skills. Enabling skills are: dialogical thinking, critical thinking, decision making, problem resolution, communication and inquiry skills. Explicit instruction in these skills empowers students both to understand issues from many perspectives, and to become effective participants in the democratic process.

The Eco-Issues framework is presented to high school science teachers during curriculum writing workshops, and is fleshed out according to individual teachers' interests and teaching environments. The workshop participants are encouraged to build into their units a series of class research experiences at the Institute's Ecology Research Display. These field trips provide the experiential basis for classroom activities which examine the scientist's role in environmental issues.

The Eco-Issues program thus uses the Ecology Research Displays as one focal point within a comprehensive curriculum unit on environmental issues. Background information on environmental issues, a framework for teaching both science concepts and the social/political/scientific interactions within the issues, and models for teaching enabling skills, round out the Eco-Issues for teachers. Through offering these resources for teachers to craft into instructional units, the Eco-Issues program maximizes the potential effectiveness of a partnership between schools and the informal learning center to foster environmental issues literacy.

Summary

The Institute of Ecosystem Studies' Ecology Research Displays are a unique educational resource which can serve a variety of education objectives. At environmental education and science centers, outdoor research displays not only raise visitors' awareness of environmental issues, but also communicate the processes whereby scientific knowledge is created. There is also very rich potential for research displays to become the basis for interpretive programs and for school curricula.

To share this educational model with interested environmental educators, the Institute of Ecosystem Studies is preparing written guides and workshop series which will provide detailed instructions for setting up a research display. This information will give special consideration to a variety of needs and constraints, providing suggestions for creating research displays on scales from quart jars to two hectare plots. Lesson plans for interpretive programs and for exemplary Eco-Issues units also will be available to educators in the near future.

DENVER AUDUBON SOCIETY'S URBAN EDUCATION PROJECT: NATIONAL SCIENCE FEDERATION SPONSORED MODEL

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In 1985, the National Science Foundation awarded a 2-year grant to Denver Audubon Society (DAS) to fund the development of a model volunteer-based informal science/environmental education project for 8-12 year olds.

DAS's project gives urban youth opportunities to discover the joys of nature right in their own neighborhood, to participate in hands-on investigations, to learn basic ecological concepts, and to interact with adults having a genuine interest in children and the natural environment. Teams of trained volunteers take children out-of-doors to explore nature within a block of their schools, community centers, or youth group's meeting place. (No nature center or natural area is required.) Seventy percent of participating children live in the central city; a third are from families living at or below the poverty level; about half are from racial and cultural minorities. The year-round program is now financed through user fees, donations from individuals, businesses, and community groups, grants from local foundations, and cooperative arrangements with government entities. Over 200 volunteers and 2,000 youngsters participate each year.

DAS has published a manual detailing how the program got started, and how it is organized and conducted. For information on the availability of the manual, contact Denver Audubon Society, 975 Grant St., Denver, CO 80203.

GETTING ENERGIZED: THE NEW YORK ENERGY EDUCATION REPORT

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Introduction

This paper describes the New York Energy Education Project, a fruitful curriculum development collaboration between industry, education and government. The Project produced a set of elementary and junior high energy education materials, and a delivery system which successfully introduced the materials in schools throughout New York State.

Project Goals

The Project goals were:

--To develop relevant energy education curriculum material that is scientifically accurate and can be successfully taught.

--To develop a state-wide network of knowledgeable energy educators (resource agents).

--To encourage a large number of teachers to incorporate energy education into the classroom.

--To help children learn accurate information about energy sources, how energy works, and how energy can be conserved. Children should also learn about issues in planning the energy future.

--To affect the behavior of children by causing them to communicate about energy to parents and other adults and to alter behavior and attitudes related to energy issues.

Materials Development

Because energy issues have controversial aspects, all sponsors of the Project were concerned that project materials and workshops reflect a nonpartisan, objective view of energy issues. To ensure this objectivity, an Advisory Committee of educators, scientists and industry representatives met regularly to advise Project staff. In addition, sixteen organizations agreed to review draft materials and supply comments. These review groups, which ranged from Brookhaven National Laboratory and the Scientists Institute for Public Information to the Center for Environmental Information and the Business Council of New York State, provided much valuable feedback during materials development, and field testing in the schools.

The close working relationship between Project staff and the State Education Department's curriculum specialists allowed the Project to integrate the material it developed into the state syllabi for various courses of study. This integration increased the receptivity of local teachers to Project workshops and materials.

Project Materials

The primary target for the Project was students in junior high and middle schools, generally grades 6-9. To provide the maximum in flexibility and usefulness all materials were designed for:

--infusion: individual activities can be selected and used wherever they are useful, in science, social studies, technology (industrial arts), home and career skills, etc.

--ease of use: materials are readily available in typical schools or inexpensive to obtain. Teacher background is provided in each activity, so no additional information is necessary before doing the activity.

The Junior High Package

The junior high materials include a series of four activity booklets containing student directions, worksheets and teacher background information. Each includes a glossary of terms and an activity matrix which relates individual activities to specific grade levels and subject areas. Each booklet is discussed below.

Renewable Energy. Seven activities include constructing a simple solar collector using several cans and different insulations, building a paper model of a passive solar home, and determining if wind energy is feasible at your home or school by collecting data on site. Also included is an activity to construct a working air-type solar collector panel, and another activity which encourages discussion of the lifestyle changes that accompany use of alternative energy sources.

Energy Conservation. Six activities are included which focus mainly on home energy use. Students conduct a survey of their current household use of appliances compared with their parents and grandparents when they were the same age, keep a personal energy use journal, test insulation materials for effectiveness, and perform their own home energy audit. Also included is an activity on investigating efficiency in a gasoline engine.

Fossil Fuels. Nine activities highlight our societal dependence on fossil fuels. Students learn about renewable and nonrenewable energy sources, explore energy conversions and efficiency, and calculate how long fossil fuel reserves will last (assuming constant use). An activity on coal strip-mining, the greenhouse effect and testing for acid rain is included, together with another activity which asks students to interpret energy cartoons, charts and maps.

Nuclear Energy. Seven activities teach about radioactivity, and how nuclear energy can be harnessed to produce electrical energy. Several games and role-playing activities are included. For example, "atomic bowling" demonstrates some atomic structure concepts. Because of the technical nature of this booklet, some activities require other activities in the booklet to be completed as prerequisites. Thus, the infusion model used by the Project could not be employed here completely.

In addition to these four activity booklets, the junior high package also includes:

--Twenty-one student readings on various energy sources, with comprehension questions. Each is typically one to two pages in length, and is designed to be reproduced.

--Sixty-five transparency/ditto masters, featuring energy graphs, diagrams and maps. Each also contains teacher background information.

--Energy Futures guide to using the Project materials. Provides and index of all student activity booklets, readings, transparency/ditto masters, plus suggested energy units of varying lengths. A risk/benefit activity is also included, with teacher background information. Features an extensive annotated bibliography of energy education resources, including teaching materials and software.

The Elementary Package

During the Project, the originally-planned elementary package of materials on electrical safety evolved into a series of elementary science activities emphasizing electricity. The two hallmarks of the junior high package (infusion, and ease of use) were also used to prepare Energy and Safety: Science Activities for Elementary Students.

In addition, the elementary materials emphasized a hands-on, inquiry-based approach to science. Each activity posed a question for students to answer. Parental cooperation was encouraged by including a note to parents suggesting ways they could help reinforce the ideas their children were learning currently. Each activity also included an appropriate energy safety hint.

Level One (Grades K-2). Twelve questions for students introducing energy and what it can do. Includes popping corn to learn that energy makes things happen, and making and coloring a mobile of energy uses and sources. Students can make a "draft detector", to use at home to see how they may save energy.

Level Two (Grades 3-4). Thirteen questions mainly on electricity and other forms of energy. Students learn about making a path for electricity using batteries, wire, a light, and several electrical conductors and non-conductors. Also included is making a terrarium, and a contest to see who can make their ice cube last longest (using various insulations, etc.).

Level Three (Grades 5-6). Thirteen questions focusing on using energy. Students make a waterwheel, learn how to recycle paper, and trace the energy changes in a car. Also included is an activity on learning about acids, the concept of pH, and testing various materials for acidity.

Teacher Workshops

Project materials, no matter how well-produced or field tested, are no more than dust-catchers on a shelf unless they are used. The New York Energy Education Project used a flexible in-service delivery system to get the message out to classroom teachers.

A cadre of forty, mostly full-time classroom teachers was recruited in 1983 to serve as Resource Agents for the Project. Each agent organized local workshops to disseminate the elementary and junior high materials. Four Project Associates with extensive background in energy education and experience as workshop presenters were selected to help in presenting local workshops, working with the Resource Agents, other Project Staff and the local utility education representatives.

The Workshops ranged from one-hour faculty meetings to all day programs, with the presentation tailored to the audience. In each workshop, the local Resource Agent, often together with either Project Staff or a Project Associate, would present a motivational slide show or talk. The State Education mandates related to energy education would then be discussed, with project materials highlighted. Some hands-on activities would be included, followed by a presentation by the local utility education representative on resources and help available from industry. Each workshop would wrap-up with an evaluation by participants.

Over the four year lifetime of the Project (1983-86) plus the last year of dissemination efforts, 389 workshops were held, reaching 9,035 teachers throughout the State.

In fact, when viewed in terms of the total school districts in the State, the Project reached 80.4% of the districts during 1983-86 (i.e. by one or more district teachers attending a Project Workshop). Almost 65% of the middle and junior high schools in the State had at least one teacher attend a Project Workshop in this same time period.

Evaluations completed by workshops participants indicated the vast majority (99%) rated the program useful or very useful. Follow up contacts with participants six to ten weeks after the workshop indicated that most participants did use Project material or had immediate plans to do so.

NOTE: For more information or to order Project materials contact Dr. William Peruzzi, New York

Energy Education Project, State Education Department,
Bureau of Science Education, Albany, NY 12234.

The New York Energy Education Project is a cooperative effort of the NY State Education Department, and the State University of New York at Albany's Atmospheric Sciences Research Center. Funding is provided by the NY Power Pool and its member electric power systems including Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Lighting Company, New York Power Authority, New York State Electric & Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., and Rochester Gas and Electric Corporation.

Initial funding for Project materials was provided by the National Science Foundation and the U.S. Department of Energy.

THE CHILDREN'S ENVIRONMENTAL FESTIVAL

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The Festival Experience

Festival Components. The Children's Environmental Festival (C.E.F.) was made up of three basic components: A) Displays, B) Performances and C) Activities.

A) Displays: Thirty groups ranging from the Ministers of Natural Resources and Environment to groups as small as the Toronto Field Naturalists were represented. We strived to have a balance of big and small groups and to present all sides of an issue.

B) Performances: There were 17 performances Wednesday, Thursday and Friday and 30 performances over the weekend for a total of 81 performances throughout the Festival. As well, there were walk-about characters and clowns to entertain groups of children and provide atmosphere.

C) Environmental Activities: Public Focus designed and had produced 19 different games and activities that were located in one of three theme areas.

Schools at the Festival. The Festival activities and site layout were designed to accommodate 50 school classes a day (roughly 1500 students). Over the 3 weekdays of the Festival this would amount to 150 classes and roughly 4500 students. Each class attended the Festival for a two and one half hour visit. Each student would see two of the seven half-hour performances (total one hour), spend a total of forty-five minutes going through the display areas, and forty-five minutes session in one of the six games and activities areas.

The visits of the fifty classes were staggered during the day so that the maximum number of classes on site was thirty-five (between 11:30am and 12:30pm). The weekday program took place from 9:30am to 2:30pm.

The Festival was designed to be as interactive as possible and to facilitate group learning. To accomplish this, classes were divided into two roughly equal groups (of approximately 15). Each group was assigned a Festival Guide to lead them during their visit.

Organizing Process

The Processes used to Plan and Implement the Program. A Planning Committee including representatives from governments, environment groups, educators and interested individuals was formed to monitor continuing progress. At each of nine monthly Planning Committee meetings the C.E.F. staff reported on plans and progress and received advice and suggestions on Festival programming.

Audience. From the very beginning the organizers of the Festival wanted to put the event together for children in grades four, five and six. It was generally felt that this group was old enough to grasp environmental concepts, but was too young to have been exposed to environmental curriculum. Another consideration was an initiative expressed by the Ministry of Education towards a more significant role for science curriculum in the primary and junior divisions (K to 6).

School Board Contacts. It was a straightforward process to arrange preliminary meetings with our individual board contacts and have them pass on information through newsletters or memos to the elementary schools. Our liaison with the Boards was developed through their curriculum and science coordinators.

We provided each school board with a specific allotment of classes based on their populations of grades 4, 5 and 6 students. Most contacts made arrangements with their schools to collect the names of interested teachers and forward these names to C.E.F. staff.

Pre-Festival School Visits. A pre-Festival school visits program was arranged to provide C.E.F. staff with a sense of what environmental issues and concepts grades four, five and six students were aware of and interested in. The attitudes of teachers towards field trips in general and environmental studies in particular, were also surveyed.

The information obtained from thirty-three school visits contributed greatly to the design of the overall Festival and to the development of specific games and activities.

Advance information about the Festival was included in a Teacher's Guide prepared for distribution during the first week of September. This guide also contained suggested lead-in activities for teachers to carry out with their students.

We implemented this plan--BUT--something completely outside of our control took place.

Strike Contingency Plan. On Tuesday September 22nd the Metro Toronto public elementary school teachers went on strike. Of the one hundred and fifty available class spaces one hundred and five had been reserved for public school classes. We had to implement a back-up plan in the space of a week. With the complete co-operation of staff were were able to increase our complement of Separate School Board classes from forty-five to one hundred and thirteen. Another fifteen classes were booked from private schools, and eight classes from public schools outside Metro Toronto also arranged to attend. In spite of the strike therefore, we were able to fill one hundred and thirty-six of the 150 available class spaces.

Timing. The organizers had considered holding the Festival in the late spring of 1987 to integrate the Festival with Environment Week celebrations. However, it was pointed out that a September Festival would allow for the greatest amount of classroom follow-up related to Festival themes and activities during the school year.

Site. The site chosen was Harbourfront's York Quay Centre--a cultural and recreational complex situated in Toronto. This site was selected because its staff are familiar with large-scale children's events. The site is also well known to teachers in the Metropolitan Toronto area. The Festival made use of over 20,000 square feet.

Displays. Twenty-six organizations contributed displays to the Festival and in most cases they provided staff to operate them. The display component was critical to the success of the event.

Many of them were designed specifically for this occasion and will be reusable.

We found that it was important to contact as many appropriate groups as possible as early in planning as possible and to maintain contact with each group on an at least a triweekly basis. When a group decided to participate, we wrote them a letter of understanding outlining site and event limitations (time, space, security, parking, etc.) and our criteria. We encouraged each participant to make their display accessible to the young audience and as interactive as possible. We found that even a static display can be made interesting if there is an animator assigned to it who is excited by the material and committed to its messages.

Theatre/Performance. It surprised us how many theatrical troops and performers are interested in the environment and finding appropriate material proved to be no problem whatever.

When a performer or troop came to our attention we would attend a performance, if at all possible, or a script and any recording, (video or audio) of the performance. We also attempted to informally review the image of the performers within and without the performance community. The major performances were: The Conserving Kingdom, We Otter Save Wetlands, Message in a Bottle, and Forest Follies.

Three troops were contracted. They were Waterwood Productions, Portable Theatre, and Eco-Nature de Laval.

Environmental Activities. Early in the planning process it was realized that displays and performances, while indispensable, would not deliver as complete a message on the child's ecological connection as we wished. A form of centerpiece was needed to tie all these disparate environmental issues to one another and more closely to the child.

It was also realized that there was a danger of creating too passive an experience for the children. We therefore, decided to create an activities element within the Festival framework and 19 games were designed, and over 40 were constructed for a major centerpiece component alongside the displays and theatre components. Topics covered by these games included: urban wildlife habitat; toxics in the home and their effect on the environment; recycling; the urban ecosystem; the food web; energy conservation; acid rain; and auto emissions. The games were split into three theme areas: Parks, Playgrounds and Forests; Home and Neighborhood; and Lakes, Streams and Farms.

Ideas for games came from Public Focus Staff, Planning Committee, the Owl Children's Magazine, children and educators. A number of the games were field tested prior to the Festival. The final concepts were developed by the Festival Co-Director Charles Dickman working with graphic designer, Nick Aitken.

Volunteers. Events of this kind depend heavily upon volunteers, During school visits we used over 70 volunteers to guide class groups of approximately 15 students, and one adult, around the festival. An additional 30 volunteers were needed to staff activities and games. For the most part (95%) the volunteers for these tasks came from a pool of grade 12 and 13 students enrolled in an environmental studies course with teacher Janice Palmer at North Toronto Collegiate. Their volunteer activity at the Festival became part of their course of study.

Other sources of volunteers included Harbourfront's volunteer pool, the Volunteer Centre of Metropolitan Toronto, York University, the Royal Ontario Museum, advertisements in newspapers, mention in various media, including weekly columns and public service announcements. The Festival poster was also widely distributed with a call-in number for interested volunteers. Four training sessions were held in September to give prospective volunteers a chance to see the site and learn more about the Festival. The students of North Toronto Collegiate were visited in their classrooms.

Evaluation

Successes. While the Children's Environmental Festival was very successful, like any event of this scope, there were definite first time problems and difficulties. Generally the concept is now a proven one; the information reached many children not previously exposed to environmental issues and early indications are that the Festival succeeded in raising the environmental consciousness of many of the attending children, not to mention quite a few adults.

The Festival acted as a catalyst for Environmental Education in the schools attending the event. Schools have requested more information and speakers from many of the participating groups. One teacher told CEF staff "this is the best event I've ever taken my kids to."

The children's interest level in all components of the festival was high. Another notable success of the Festival was the use of high school students as guides. Not only did they help the project, they themselves learned much about the environment and had their first experience as environmental educators.

Concerns and Lessons Learned. This event started for school children at 9:30am. This is too early; we now believe that events for schools should not start before 10:00am or end after 2:00pm.

To accommodate the number of children, we scheduled the event very tightly perhaps too tightly. This means that when one performance ran late another was forced to start late and often a group would arrive for a performance late, disrupting the flow and schedule for others.

We had to rely on too many volunteers. It was impossible to educate and train all of these volunteers adequately in advance. Consequently much training was done "on the job" just prior to arrival of classes or during the events. To solve many of these problems we believe that future Festivals of this kind should run for more consecutive days, with shorter hours each day and fewer children on site at any one time.

Conclusions

Overall the concept of a Children's Environmental Festival is sound. Each of the components assembled for the first event of this kind worked well. The problems that we encountered will be solved given fewer children to deal with in any one day's program and a schedule with greater flexibility. The only alternative to fewer numbers is either considerably higher costs associated with training and staffing or lower quality of delivered program. We would opt for quality every time.

LIVING (HAPPILY) IN THE WINTER CITY

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For most people, throughout most of history, "winter cities" have not provided the primary examples of what urban living was supposed to be. Urban life began in climates which were tropical, not chilly, and so most of the basic assumptions about urban life and services--housing, transit, architecture, parks and recreation, health care, the arts--are based on the assumption of warm weather. Although in the past 500 years or more, major cities have arisen and prospered in colder climates (such cities as Hamburg, London, Stockholm and Moscow were centers of world economic life well before the Europeans colonized America), most patterns of urban living continued to reflect tropical origins. It was only over a long period of time that European cities evolved a special set of responses to winter.

During the 19th century American living in colder climates began to develop cities which, like their European counterparts, acknowledged the impact of changing seasons. Entertainment went indoors--the theater, concert and opera seasons were developed for winter. Both urban and rural families acknowledged seasonal changed by preparing carefully--canning and storing food, sewing and knitting winter clothing, preparing sleds. But as the 20th century brought with it such innovations as efficient central heating, private transport, the telephone and television set, it became possible to minimize or even deny almost entirely the impact of winter. Communications technologies even made it possible to conduct business from home, avoiding a wintry journey to work. It is only recently that a specialist in winter cities could say, with regret, "We´ve let the conveniences of a technological society deny us a season of the year." (Gappert, 1987)

In recent decades much of the U.S. appeared to be attempting not only to deny winter, but to escape it altogether. The "Sunbelt Shift" is one of the most important phenomena of recent history. By 1980 "Frostbelt cities" were proclaimed dead or dying, as industries and people departed. The South (aided by the widespread availability of air-conditioning, by the collapse of institutionalized racism, and by the lure of lower taxes and less expensive labor) captured the economy to such an extent that John Naisbitt's 1982 bestseller Megatrends (Naisbitt, 1982) declared "the shift from North to South is irreversible in our lifetimes." This belief became so generally accepted that it was a great surprise when, four years later, the same author declared with equal confidence that the Frostbelt was resuscitating and that "The (Great) Lakes Will Rise Again!" (Naisbitt, 1986). Water, in fact, was seen as a key to the revival of northern cities, but the leaders of these cities point out that they have other vital resources as well: excellent educational systems, progressive traditions in urban government, a skilled labor force, high-quality urban infrastructure, quality older housing, the arts and theater.

Still, there is no denying the cold. Frostbelt leaders are now seeking ways of making colder cities an enjoyable and preferable environment, and are looking for the technological, architectural, and social innovations which will offer year-round livability. Many of these have been chronicled in The Winter City Book (Rogers and Hansen, 1980), a pioneering work by William C. Rogers of the University of Minnesota. To Rogers "Step Number One is to realize that you are not in Miami." Winter cities require a different architecture, different building materials and colors (wood and brick, reds and yellows, rather than steel and glass, blues and whites), and different plantings. (Rogers favors evergreens, which despite a reputation as difficult plants, offers varieties which grow steadily and successfully in city air.) The key is in realizing that what works in the tropics doesn't always work in the north. Begin with the streets of the city: it is realistic to assume that people will not want to use streets which offer no shelter from ice and wind. The most famous examples of winter-city adaptations are examples of enclosure. The skyway systems of Minneapolis and St. Paul connect the second storeys of the downtown buildings, providing a continuous and sheltered route. Unlike the newer covered shopping malls the skyways use the already-existing downtowns, and so can take advantage of public transportation in a way that malls do not often do. Other welcome forms of pedestrian shelter include fully-enclosed bus shelters, tunnels, underpasses, and galleries.

Still, there is no need to attempt to tame the weather completely. Many northern cities have made successful attempts to stress the positive attributes of winter and to celebrate the beauty of the season.

Winter carnivals have been great attractions for visitors and for residents: Quebec's Carnaval de Quebec; Ottawa's Winterlude; Anchorage's Fur Rendezvous are examples, as are the winter festivals of Chicago, Boston, and other U.S. cities. The popularity of cross-country skiing and ice-skating gives cities an incentive to maintain open space and water, which can be enjoyed year-round. And the economic possibilities of celebrating winter, if one requires them, are considerable. In February 1988 the city of Edmonton will host a Winter Cities Showcase, subtitled "The Business of Winter", focusing on finding solutions to cold-climate challenges and to capitalizing on cold-climate advantages.

It is natural that the pioneers in winter-city livability have been the Canadians, the Scandinavians, and the Soviets. The northernmost city of over 100,000 people is in the Soviet Union (Noril'sk, at 71° north), and it has become a laboratory of urban winter, the locus of many innovative technological and design solutions which have been closely documented by Western scholars. The Scandinavians have pioneered in winter architecture, including climate-controlled and glass-enclosed cities. Canada offers an array of university-based centers whose study of urban affairs includes the study of winter as an urban social-policy issue. It also offers the pioneering work of the Livable Winter Cities Association, dedicated to improving adaptations to and attitude toward life in winter climates. Perhaps its location in Toronto, often described as "the world's most livable city" (not only the "world's most livable winter city") is significant.

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ENVIRONMENTAL EDUCATION AS A LAKE MANAGEMENT TECHNIQUE

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Introduction

Traditional lake management techniques have focused on technical/bureaucratic approaches to lake problems. Under these approaches scientists, resources specialists and public agency personnel work to identify mitigation and management strategies that can ameliorate short- and long-run lake-related problems. The "public," or citizens of the affected region are kept informed of emerging lake management strategies, but often are not considered central to strategy development due to the complex and scientific nature of many lake-related problems.

In the spring and summer of 1987 the University of Wisconsin-Madison Water Resources Management program's applied workshop attempted to craft an alternative approach to lake management that stressed public environmental education as its foundation. Unlike some public relations type efforts, the workshop stressed environmental education that could lead to informed public action.

The main vehicles used to establish environmental education as a viable lake management technique were: development of a middle school (grades 6-8) lakes-related curriculum; development of a citizens' guide to the Madison (Wisconsin) area lakes; a slide/tape presentation on lake problems and solutions; and development of a proposal for creation of a lakes awareness center. This paper outlines the strategies that were employed in development of each of the project components and explains the rationale behind using environmental education as a way of improving existing lake management practices.

Role of Environmental Education in Lake Management

Lake problems today are often complex in terms of both causes and possible solutions. In the case of the Madison, Wisconsin urban area, commonly cited problems include episodic algae blooms, uncontrolled weed growth, a changing fishery, toxic chemicals in the lakes, and occasional user conflicts. Government responses to these problems have included actions such as periodic weed harvesting, urban and rural runoff controls, and a fishery alteration project.

While the long-run efficacy of some of these techniques is debated, their greatest challenge is maintaining long-term public support. In the absence of a clear picture of the benefits of such programs, the intricacies of a lake ecosystem, or the value of a lake resource to the general public, many lake management efforts appear costly or socially irksome.

Environmental education can play two important roles in lake management efforts. First, environmental education can significantly increase an individual´s "ownership" of a natural resource such as a lake. The process of learning about a lake--its problems, its virtues, its future--is a crucial first step in treating the resource as a living organism. Second, the knowledge gained through environmental education allows individuals to understand the complexities of the issues involved in lake management and provides a basis for development of realistic expectations concerning management techniques that are undertaken.

Environmental Education Strategy

The 1987 Water Resources Management workshop attempted to devise an environmental education effort that would promote improved long-run management of the Madison area (Yahara) lakes. The strategy involved presenting information to various segments of the area´s population in such a form that they could move toward informed action. Thus, the goal was not education for education´s sake, but education that could lead to action.

The education problem was divided into three elements. First, the education of those just forming their ideas concerning natural resources was deemed important. Thus, young people in the early teenage years were identified. Second, individuals with established ideas concerning the area´s water resources were identified. This represented "average" post-high school residents in the area. Third, the need to establish a long-term educational delivery mechanism was considered important to ensure that environmental education was not a "flash-in-the-pan" lake management effort.

The following discussion highlights some of the major components of the educational efforts that were developed.

Caring for Our Lakes: A Curriculum on the Yahara Watershed

It was clear that if long-term improvement was being sought in the quality of Madison area lakes, some provision needed to be made for individuals that would be affecting the lakes in the future. With the advice of area environmental educators it was decided that a curriculum should be developed for the sixth to eighth grade level, since these students are at a more impressionable age than high school students. Two options were identified for the overall goal of the curriculum. Either students could learn specifically about the Madison lakes and their problems, or they could learn about topics such as aquatic ecology, conservation, and ethics through the use of the lakes as examples. Teachers in general favored the latter approach.

A three-week unit consisting of approximately ten lesson plans was developed. The objectives for the curriculum were increased student awareness and understanding in: familiarity with the geography of the local watershed (geophysical, human, and environmental aspects); understanding of the lakes as a part of a larger ecosystem; identifying problems and issues concerning the lakes; skill development (scientific investigation, problem solving, graphing, language arts, group interaction); recognition of human activities and impacts that result in lake problems; and development of an environmental ethic that includes respect for aquatic resources.

The topics covered within the three-week curriculum included:

--introduction to the Madison area lakes
--geography of the Madison area lakes
--groundwater and the hydrologic cycle
--introduction to aquatic ecology
--microorganisms of the Madison area lakes
--the aquatic food chain
--aquatic habitats
--water quality indicators/monitoring
--pollution of the Madison area lakes
--land use and water quality of the lakes
--environmental ethics and decisionmaking
--actions students can take.

Decisionmaking and ethics, along with scientific understanding were considered central to development of the curriculum.

Lake Watch: A Guide to the Care of the Yahara Lakes

Adult education posed more difficult challenges than youth education since the audience was more diverse and since many values concerning lakes had already been developed by the area's adult population. Madison area lakes, especially Lake Mendota, enjoy a reputation of being among the most studied lakes in the world. Lake Watch was intended to bridge the gap between the scientific community and the general public.

Lake Watch is a 29 page description of four major concerns repeatedly identified by area residents. The topics covered include: algae, aquatic plants, the fishery, and toxic chemicals in the lakes. The general format followed in each section was 1) identification of the problem; 2) discussion of the causes of the problem--including interrelationships among lake and land elements; and 3) a discussion of things that could be done to ameliorate the problem.

Lake Watch is intended for distribution by local civic organizations and several local newspapers have either printed articles based on the document or have expressed interest in publishing it as a supplement to their daily or Sunday editions.

The Yahara Lakes--Reflections of the Land

Related to Lake Watch was the production of a 12 minute slide/tape program titled, Reflections of the Land. The purpose of this educational effort was to present a specific message to adult audiences on the impacts of land use on the area's lakes. The slide/tape program includes an introduction to the concept of a watershed, descriptions of the various ways of "valuing" a lake resource, discussion of lake problems and solutions, and guidance for citizens on actions that they can individually and collectively take to improve the lakes in the short- and long-term.

Reflections of the Land is accompanied with a set of discussion questions and handouts that can be used in local meetings to increase participant awareness and understanding.

Yahara Lakes Resource Education Center: A Concept Proposal

The last element of the educational strategy was creation of an ongoing institution or mechanism that would ensure lake education in the future. To accomplish this goal a concept proposal was written that considered options for establishing a lake awareness center.

The proposal described the concept of a long-term education effort, defined goals, and discussed possible delivery mechanisms.

The proposal presents several different center scenarios, described in terms of their physical and operational components. The proposal also presents an inventory of potential sites in the Madison area, an analysis of public interest in a center, and a review of existing education centers in the state. The tasks of implementation and funding are also discussed. In general, the proposal contains necessary information to tailor an agency budget, write a foundation grant, and fund and implement a resource education center for the Madison lakes.

To date, several organizations have expressed interest in various aspects of the proposal.

Summary

The effectiveness of environmental education as a lake management technique will be difficult to measure. Although technical/bureaucratic approaches to lake management can produce tangible results, environmental education can ensure that these efforts are enhanced and sustained over the long-term through an informed and concerned public.

MAINE'S SCHOOL SCIENCE AND NATURAL HISTORY ENRICHMENT PROJECT

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The project is a statewide, cooperative effort of the Maine Audubon Society, University of Maine at Farmington, and College of the Atlantic to provide teachers of grades K-12 with:

--Maine-based science enrichment activities and materials;

--training in effective science teaching methods that capture student interest;

--access to, and knowledge of, local resources;

--volunteer partners from the community to assist in developing and implementing science lessons.

The project employs a three-tiered dissemination model. First, during year one, a pilot group of twenty carefully-selected teacher/volunteer teams was trained. These teams are now playing a key role in assisting project staff in training 320 additional teams over a two-year period. Finally, participants from all three years of the project are voluntarily training others in their own regions.

Thorough research in the development of the commercially-published supplementary curriculum materials used in the project (Science and Natural History: A Maine Studies Sourcebook originally funded by the U.S. Department of Education), and the success of the year-long pilot program resulted in a strong project model which received a major two-year grant from the National Science Foundation. The diverse partnerships between an environmental organization, colleges, public and private schools, and community members, have attracted matching funding from a wide range of sources: corporations, foundations, schools, and private individuals.

A cornerstone of the project is the four-volume curriculum supplement Science and Natural History: A Maine Studies Sourcebook by Dean Bennett and Peter Corcoran. The Sourcebook is designed to enrich science teaching for grades K-12. Organized in four looseleaf volumes--Physical, Earth, Life and Ecological Sciences--the material corresponds to curricula used currently throughout the state. The series include specific background on Maine's natural history, and a wide range of inexpensive and easy-to-teach activities: discussion ideas, worksheets, experiments and research projects, small group activities, field explorations, and learning games. From a local standpoint, the Sourcebook's greatest strength is its use of Maine's environment as a teaching resource and basis for scientific inquiry.

Although the School Science and Natural History Enrichment Project places a major emphasis on Science and Natural History: A Maine Studies Sourcebook as a resource for teachers in Maine, the project's goal is actually to provide teachers with a clearinghouse of information on an entire range of resources available to them: materials, programs, people, field trip sites, etc. The Sourcebook itself is designed to do this, and the project workshops and newsletter offer up-to-date opportunities to share new resource information.

Teachers who elect to participate in the School Science Project take an active interest in Maine and its natural resources, and want to learn more about the state themselves. They also want to teach science more effectively by using topics and techniques relevant to their own and their students' lives. Teachers of all grades and backgrounds are encouraged to apply. Experience of past participants ranges from a kindergarten teacher intimidated by science to a high school teacher with a master's degree in biology.

Planning and conducting enrichment activities can put excessive demands on teachers whose schedules are already full. Community volunteers, while easing the burden for teachers, can enhance the students' learning experience in many creative ways. They provide varied skills and knowledge, additional supervision and individual attention for small-group or outdoor activities, and assistance with research or gathering materials. They also provide moral support, and new perspectives on the local community.

The need for, and the role of, a volunteer varies from classroom to classroom.

To build an effective teacher/volunteer relationship, each team reviews a list of questions that identifies their personal and professional goals regarding the project. Together they write an informal contract which enables them to have a clear understanding from the beginning. The relationships they develop are constructive, and, in many cases, remarkable. Teachers report that their volunteer partners are indispensable as planners, leaders of outdoor and classroom exercises, schedulers of classroom speakers, and motivators. Most volunteers come from teaching or science backgrounds and bring an extra level of professionalism and creativity to the project.

Initial training workshops are held each fall in eight different locations statewide; twenty teacher/volunteer teams attend each one. Workshops are led by experienced teacher/volunteer teams, Maine Audubon Society staff, and the Sourcebook authors. The workshop agenda includes an in-depth look at the Sourcebook and practice developing and implementing its activities, tips for working effectively with volunteers, experience in conducting field studies, a brainstorming session on local resources, instruction in evaluation techniques, and presentations of practical applications by previous teacher/volunteer teams.

Following the introductory workshop, teams are provided with ongoing assistance in the form of a newsletter, classroom visits, referrals to resources, and curriculum materials from the Maine Audubon Society's lending library. Several months later, after teams have had sufficient opportunity to implement project materials and concepts in their classrooms, a follow-up workshop is held in each region. At this time, teacher/volunteer teams share successes and problems; exchange new ideas, resources, and science lessons generated by the project; compare student results; participate in a field trip; and consult again with project staff.

One of the simplest, yet most important, benefits of this project involves the exchange of ideas between teachers involved. Many experienced, committed educators feel isolated in their classrooms and are finding this chance to share their creative ideas the most rewarding aspect of the project.

Evaluation of project results is showing that participants are experiencing marked improvement in their science teaching skills and confidence. Teachers are developing the ability to engage their classes in scientific inquiries and are enriching their curricula with new, discovery-based activities and units. As a result, they are finding that science and its newly-discovered relationships to daily life totally absorb their students (and themselves!).

The School Science and Natural History Enrichment Project model is easily replicated in other regions. The collaboration of educational institutions--environmental organizations, colleges and universities, state agencies, and the like--who share a common goal of enriching science teaching can be an effective tool anywhere. Dissemination of excellent science enrichment activities and materials, and information on and access to local science teaching resources is a common need worldwide, and, although Science and Natural History: A Maine Studies Sourcebook is an important resource and easily adaptable in other regions, it is not essential to such an endeavor. Instead, other existing high quality resource materials (preferably, some of these will by locally-based) can be substituted. In addition, volunteer involvement in the classroom has proven to be extremely effective, and offers the additional benefit of increasing community awareness of and involvement in local schools.

In conclusion, Maine's School Science and Natural History Enrichment Project build its success on an experienced, cooperating project staff and excellent curriculum resources. These provide the starting point for enthusiastic, committed science teachers to learn new skills, gain confidence, and enrich their own curricula with the aid and encouragement of able community volunteers. Equally as important, experienced pilot year teachers provide new participants with the successful models and professional guidance and motivation necessary for solid professional development.

AN INTERDISCIPLINARY MAJOR IN ENVIRONMENTAL EDUCATION

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As environmental educators, we have chosen a field that is vitally important yet often frustrating. In the words of Aldo Leopold (1966):

> One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise.

Reflect for a moment on your past. What experiences in your life stimulated your concern for the environment? What experiences in your education helped determine your decision to become an environmental educator?

When I was in high school during the late 60s, I participated in a National Science Foundation program in Field Ecology sponsored by Foresta Institute in Carson City, Nevada. The experience greatly affected my professional goals and I began searching for an undergraduate program in Field Ecology. I selected a program which I believed would offer an innovative approach to studying ecology and would also offer me immunity from mandatory dissection of animals in laboratory courses. My ethical position was immediately challenged in my first zoology course. Despite the fact that I had scored well on all exams, the instructor challenged me by requiring that I participate in a lab final which involved the dissection of a live mouse. I dissented and was threatened with failing the course. I remained firm with my conviction, and the instructor relented, allowing me to write a paper in support of my philosophical beliefs. While researching my paper, I discovered the writings of Joseph Wood Krutch (1977), and the following quote which spoke to my ethical position:

> Unfortunately, the scientific study of living creatures does not always promote either reverence or love. The laboratory scientist is not of necessity drawn into any emotional relationship with animals and experiments which of necessity he must perform are more likely to make him more rather than less callous than the ordinary man.
>
> At best, compassion, reverence for life, and a sense of community of living things are not an essential part of his business as they are of the more vaguely defined discipline of the naturalist. And for that reason it is a pity that the most humane and liberal of the natural sciences should play so small a role in the liberal arts curriculum. Biology as commonly taught is not a humane subject, it is simply an elementary preparation for the trade of the specialist.

This quote not only provided me philosophical support for what I deeply felt about reverence for life versus the objectivity of science, it also provided me with a challenge. I was beginning to realize that, while science fascinated me, and provided essential knowledge needed for my understanding of the environment, it provided only part of what I was seeking. I was beginning to understand that while scientists are gaining valuable knowledge about the environment, we are losing the battle because of an uncaring and uninformed population that is often alienated by scientific language and objectivity. We are losing the environmental battle because our society continues to make economic, political and ethical decisions which are frequently at serious odds with our scientific understanding. This basic understanding and integration of environmental concepts is virtually lacking in much of our educational system, especially at the university level where the teachers and future leaders in business and polities are educated.

I decided that if I really wanted to make a contribution, it would not be as a scientist, but as a bridge between the scientists and the layman. I decided to become an Environmental Educator.

I received my Masters' at George Williams College and worked under Dr. Ed Clark and Steve Van Matre. I discovered that it was O.K. to be a scientist and also be sensitive, to touch a flower, and not necessarily have to name its genus and species, and to feel the beauty of poetry in a quote that Ed would often repeat to illustrate the concept of interrelatedness. "Thou cans't stir a flower without troubling a star."

After graduate school I worked as a ranger at Canyonlands National Park. The wild and remote canyons that harbor the spirits of the Anasazi inspired me to consider the impact of cultures on the landscape. The job also exposed me to the world of politics, resource management, visitor contact, management plans, NEPA, EISs, paving roads, increased visitation yielding increased budgets, ORVs, law enforcement, mace, guns, cardboard silhouettes of human targets, and Edward Abbey.

I left the Park Service after two years--I couldn't carry a gun--it wasn't the way I wanted to relate to people. I was offered a teaching position at Prescott College and the opportunity to create a program in Environmental Education. The challenge was both exciting and overwhelming. How could I integrate all that I had learned and felt, into a program that would instill in my students the need to "Think Globally, Act Locally, and Care Personally."

What courses could I teach that would synthesize my background in science, education and government agencies? How could I create an interdisciplinary major in Environmental Education that would combine science, education, philosophy, history, literature and politics...to really do at the college level, the kind of integration we ask of teachers in the lower grades.

The program I have developed over the past nine years will continue to develop as I continue to learn, but I do feel a great sense of achievement in the goals which I established for the program. These goals are:

--A solid foundation in the natural sciences and a working knowledge of basic ecological concepts.

--A broad interdisciplinary background in theoretical and philosophical perspectives.

--The development of a personal environmental ethic through values and decision-making.

- --The knowledge and skills to design and implement an environmental education curriculum.

- --Direct field experience and a required demonstration of competence prior to graduation.

Students majoring in environmental education design their own programs with careful supervision of a graduation committee. They are encouraged to develop a strong background in environmental studies with a balance between the sciences and philosophy.

Some of the recommended preparatory courses include: Natural History, Ecology, Geology, Economics, Philosophies of the Interpretive Naturalists, and Contemporary Issues of the Environment. Students are also encouraged to take educational methods and psychology courses, and may also complement their major in environmental education with minors in Outdoor Recreation, Human Services or even Spanish Language. They may also choose to take the required courses for teacher certification.

Once a student has demonstrated an appropriate background preparation, they are ready to enroll in an advanced level course entitled Environmental Education and Teaching Methods for Science. Prior to graduating, students must demonstrate their competence in Environmental Education by successfully completing an internship at an approved environmental education facility.

Many of the courses in a student's program are designed with an interdisciplinary format that encourages the study of interrelationships among history, culture, literature and the environment. An example of this is the course titled, Cultural and Coastal Ecology of Kino Bay, Mexico.

Our academic calendar allows us to spend a third of the year in the field. Students begin the course by reading, Log of the Sea of Cortez, by John Steinbeck. In his words:

> Let's go wide open. Let's see what we see, record what we find, and not fool ourselves with conventional scientific structures. By going there, we would bring a new factor to the gulf. Let us consider that factor and not be betrayed by this myth of permanent objective reality. We shall take something away from it, but we shall

> leave something too. We take a tiny colony of soft corals from a rock in a little water world. And that isn't very important to the tide pool. Fifty miles away the Japanese shrimp boats are dredging with overlapping scoops, bringing up tons of shrimps, rapidly destroying the ecological balance of the whole region. That isn't very important in the world. And thousands of miles away the great bombs are falling and the stars are not moved thereby. None of it is important or all of it is.

And so we study the marine biology, and the impoverished fishing village of Kino Bay--where fishermen can no longer make a living from the sea but instead make ironwood carvings, imitating those created by the nearby Seri Indians. Now the ironwood is being depleted.

We study the effects of pesticides used on agricultural lands to provide vegetables for the U.S. and in turn pollute the estuaries making the exportation of oysters to the U.S. illegal--chemicals obtained from the U.S.

We also live with the people of Mexico, and fall in love with the children, who despite their poverty seem happy and innocent of the vast international games of economics and politics that silently filter down to influence their world.

We come away with a new understanding of ecology, of the relationships between countries and cultures, and an awareness of our role in influencing lives and environments beyond our border. And either "none of it is important or all of it is." (Steinbeck, 1941)

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CHOOSING MEDIA FOR A MALAYSIAN PARK TRAIL

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Introduction

To help insure the success of park educational programs, it is necessary to evaluate the methods through which environmental information can be presented. Guidelines are needed to aid in the selection of optimal media for a particular communication. Slides, signs, guides, and booklets are frequently used in park interpretation, yet only a few studies have been conducted to determine the effectiveness of these media in achieving specific educational objectives, or the circumstances dictating when one medium would be preferable to another (Mahaffey 1970, Olson et al. 1985). Of the many media comparison studies that have been conducted, very few are in the field of nonformal education or deal with simple, inexpensive media appropriate for a park interpretation program (Schramm 1977, Wagar 1982). The need for this research is particularly acute in Southeast Asia where park program development is relatively new, and programs have not been subjected to formal evaluation.

Park trails are a popular facility for interpretation in many national parks. Guides, booklets and signs are commonly used to explain an environmental story along a trail. At Kinabalu Park in Malaysia, I designed questionnaires to test the effectiveness of these three media formats in interpreting a nature trail for park visitors. I assessed effectiveness from the amount of correct environmental information retained by park visitors exposed to each medium. This study tested the null hypothesis that the mean test scores of the three media treatments would be equal. The questionnaires also recorded visitor sociodemographic backgrounds to determine their influence on the effectiveness of the media format. Additionally, public preference for each medium was determined.

Methods

Experiment 1.

The study area has been described elsewhere (Jacobson 1985). Three trail media formats (guides, booklets, and signs) were tested for their interpretive effectiveness from April to November, 1985. The 20 minute loop trail introduced visitors to the diversity of plant life in Kinabalu Park and the medicinal and economic uses of some of the plants.

Each media format was presented for about 2 months, subjecting 1,194 visitors to 1) a guided walk led by park naturalists, 2) a self-guided walk with numbered posts and booklets, 3) a self-guided walk with signs at each station, or 4) the absence of interpretive media, to serve as a control. At the end of the trail, visitors completed a multiple choice test, in Malay or English, based on information presented at each station. The mean test scores for each media format were compared using ANOVA procedures.

Experiment 2.

I conducted a second experiment between November, 1985, and January, 1986, comparing only the relative effectiveness of signs and booklets. Both media were used during a single walk, and the number of correct answers for each medium was compared. In this way, the subjects served as their own controls, and the more powerful paired t test was used to determine differences in media effectiveness.

Results

The mean scores for the guide treatment were significantly higher than the other treatments, and the control group scores were significantly lower; there was no difference between scores for the booklet and sign treatments (F3,1190=173.76, c=0.05). The sociodemographic background of the visitors had little influence on media effectiveness. In addition, more visitors subjected to the guide treatment found the trail very interesting than those exposed to other media (X2=25.43, df=3, $p < 0.001$). The variation among park naturalists conducting the guided walks could have influenced the effectiveness of the guide treatment. However, no significant score differences resulted from visitors exposed to different guides.

The second experiment discriminated more closely between the effectiveness of the booklet and sign treatments. Five hundred and sixty-seven visitors were subjected to both media treatments and served as their own controls. Still, no difference between treatments was found (Paired t test, $t=0.22$, $df=566$, $p > 0.05$).

Discussion

A mix of media formats is often desirable for a park interpretation program (Sharpe 1982). Diversity provides "something for everyone," and can attract the interest and serve the needs of a heterogenous audience. Mahaffey (1970) found that visitors to a Texas historical site preferred a mixture of interpretive media rather than only one. However, it is necessary to determine what type of media is most effective for a particular communication. In a study of four nature preserves in Ohio, Olson et al. (1985) found that presentation of management concepts using booklets and personal services were effective in increasing visitors' knowledge and attitude levels; signs were ineffective. Where funding, staff, or facilities are limited, as in most parks, it is crucial to choose a media format wisely. Alternative courses of action need to be identified and an optimum mix of media developed based on the objectives of the interpretation and visitor and organizational needs.

The relative effectiveness of the guided walk treatment at Kinabalu Park is consistent with traditional assumptions that personal services are the ideal interpretive medium (Field and Wagar 1973, Sharpe 1982). Guides can tailor the interpretive material to the needs of each group. Their personal attention can stimulate visitors and answer their questions. Guides can modify their material with seasonal changes and can incorporate spontaneous experiences on the trail into their interpretation.

Factors other than effectiveness in increasing visitor knowledge must be considered in selecting interpretive media. Although the highest mean score was attained with guided walks, the fewest number of visitors were served. For the guide treatment, only 9% of the visitors took the trail walk, due to the limited number of guides. Whereas, the number of people served by the written media could potentially reach 100%. However, it is unlikely that the low percentage of visitors reached by the guides could be increased substantially due to the limited number of guides.

Other factors to consider in the choice of media include funds, facilities, visitor background, time, and interest, and interpretive location and subject. Table 1 (modified from Sharpe 1982) quantifies the relative advantages of each media format based on the results of the trail experiment at Kinabalu Park. It shows that in considering all factors equally, signs and booklets may be almost as effective in park interpretation as a guide. To evaluate which media should be used in a particular situation, weightings can be given to each factor depending on its perceived importance. The summed scores of the different media can then be compared. In this way, Table 1 can serve as a guide for media selection given a variety of needs and circumstances.

Table 1. Relative advantages of three media formats (guides, booklets, and signs) for trail interpretation at Kinabalu Park (modified from Sharpe 1982). Numeric scale ranges from 1 (= worst) to 3 (= best).

FACTORS FOR SUCCESSFUL INTERPRETATION	MEDIA		
	GUIDE	BOOKLET	SIGN
1. Effectiveness in increasing knowledge.	3	2	2
2. Visitor preference	3	2	2
3. Greatest number of visitors reached.	1	3	3
4. Low cost.	1	2	3
5. Subject to minimal vandalism.	3	2	1
6. Minimal climatic destruction.	3	2	1
7. Minimal source of litter.	3	1	3
8. Minimal source of trail deterioration.	3	2	1
9. High souvenir value, information can be shared outside park.	1	3	1
10. Low maintenance.	3	1	1
11. Ease of modification.	3	1	2
12. Maximal availability.	1	2	3
13. Visitors set pace.	1	3	3
14. Tailored to variety of educational levels.	3	2	1
15. Available in many languages.	1	3	2
16. Two-way communication, opportunity for visitor feedback.	3	1	1
17. Visitors can use selectively.	1	3	3
18. Consistent information quality.	1	2	2
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TOTALS:	38	37	35

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MIGRATION--IT´S NOT JUST PASSING THROUGH

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Computerized bank tellers, lunar adventures, DNA manipulation and Star Wars weaponry: all were objects of dreams a scant quarter century ago--little wonder that an immense gap has developed between lay people and the scienctific community. It is difficult for us to grasp the significance of the chasm between scientific knowledge of the 21st century and natural observable events which unerringly unfold each day, each season, and each year.

But if we are to remain an integral part of this world, the chasm must be bridged. To do this will require a concerted effort to educate so that we become better able to exist in a setting that is compatible rather than adverse to nature.

Education occurs in many ways on many different levels. A difficult task for any educator is to motivate students and sustain their interest. When motivated, children absorb an incredible amount of information. Therefore, it is the task of the educator--teacher, parent, religious leader--to guide children in learning the appropriate modes of behavior and set of values. As environmental educators, an important step in accomplishing our goal is to encourage children to become familiar with, then integrate, environmental awareness into their everyday lives. New activities and experiences within the natural world should yield not only an understanding of environmental concepts and processes, but a general feeling of involvement and appreciation for a system in which we all play integral roles.

Progress and development has brought great demands on our natural resources. Manipulation and consumption of resources have expanded to meet consumer demands with little regard for the impact resulting from destruction of habitat. Many decisions are left to "the experts," whereas, the larger segment of the population, whose knowledge of environmental concepts is limited, has little to say about the course of development. It is this state of affairs that prompts us to encourage the use of process-oriented and content-rich curricula in schools and environmental education centers. The curricula should span all disciplines as no facet of education can be isolated. It should actively involve both the teacher and the student by supplying proper background and enrichment materials and age-appropriate lessons.

Units of study should encourage students to use the essential elements of problem solving: describing, predicting, testing theories, and evaluating outcomes. Also, it is important for students to interpret and communicate information in an understandable form. It is our belief that creative nature education can lay the groundwork upon which sound environmental decisions will be based. Therefore, it is important that a unit of study should hold a child's attention. Because migration is intrinsically interesting, it will accomplish this task.

In every habitat, almost any time of the year, migrating animals are evident. Spring and autumn are the best times for observing animal movements because in many cases, spectacular numbers move along traditional migration routes. Although scientists provide theories about why and how these movements occur, there is still an emotional element when observing a "V" of migrating geese or the spouts from a pod of humpback whales moving along the coast. These observations arouse our curiosity and inspire our questions. Imagine seeing the process from a child's point of view! With a subject such as migration, they not only learn about the animals and their behavior, but hopefully they will learn to respect and appreciate the many natural phenomena that occur on the earth. Appreciation can only yield a desire for protecting our remaining resources. Migration is also a vehicle for teaching about critical environmental issues: Habitat preservation, the effect of increasing population on natural resources, the effect of toxins in the environment, and the effect of economic/commercial pressures on wildlife.

It is with these thoughts that we have developed a unit of study on migration that can be easily incorporated into any curricula.

Migration Facts

1. What is migration? Migration is the regular seasonal journey to and from a specific area. Birds, such as the Arctic Tern, travel 20,000 miles round trip between their wintering and breeding grounds, while Blue-spotted Salamanders may travel only a few hundred yards from a hibernation spot to a breeding pond.

2. At what time of year are migrating animals evident? It is possible to find a migrating animal at almost any time of the year, although spring and autumn movements often warrant the most attention.

3. Why do animals migrate? No single factor causes animals to migrate. Most likely it is triggered by a combination of:

    a. biological responses to the length of day and change in temperature

    b. food availability

    c. competition for territory or food

    d. reproduction

4. How do animals know where they are going? Some animals can go to exactly the spot they wintered or bred the previous year. A combination of techniques are used, as well as being used singly.

    a. smell (deer, fish, amphibians)

    b. echolocation (bats, whales)

    c. visual cues (birds)

    d. instinct

5. How has man influenced migrating animals?

    a. created wildlife refuges to protect critical areas

    b. destroyed and/or altered habitat necessary for resting and feeding areas

c. disposed of toxins into fragile ecosystems

d. created captive breeding programs to reintroduce migratory animals into certain areas.

Migration Activities (adaptable to Grades K-6)

Migration Chairs

Background: Migrating animals require specific habitats along their route for feeding and resting. As these critical "staging areas" are developed, the rate of survival for these migrating animals decreases.

Lesson Objectives: Students will participate in a migration simulation (based on musical chairs) that demonstrates the need for habitat preservation.

Follow the Leader

Background: Trail markers or other visual signs enable us to walk through woods or field with relative ease and little fear of getting lost. Migrating animals also have visual cues that guide them on a route that is nearly identical to the one they've used for many years. These cues may be the configuration of a coastline, a series of mountain ridges, the course of a river, or the position of the sun and stars. This amazing ability is not completely understood by scientists and they usually attribute it to instinct or imprinting.

Lesson Objectives: Students will take turns being a leader through an unmarked area. Students will practice using visual cues by making a trail in unfamiliar territory, then try to find their way back to the initial starting spot.

Migration Scents

Background: Many animals, especially mammals and fish have a very good sense of smell. Areas are marked with scents to outline breeding and/or feeding territories. During migration, smell may be used by itself or with other senses to determine direction and ultimately destination.

Lesson Objectives: Students will follow a simulated migration scent trail. They will be able to verbalize their impression of what was encountered along the way, and how a migrating animal would deal with these "problems."

Imprint

Background: Many animals know their migration route by instinct or through imprinting.

During migration, instinct is the unalterable ability of certain animals to follow a path they never travelled before. In the fall, Monarch butterflies make a southward migration to central Mexico. None of the butterflies travelling south have ever been to their "wintering grounds" before because all of last year´s wintering adults have died. But, using their instinct, Monarchs will arrive at the same spot, year after year.

Imprinting is a lasting impression or blueprint in an animal´s mind regarding its specific birthplace and the conditions surrounding its early learned behavior. Young animals learn how to hunt, where to find food, and how to evade predators from their parent(s). The lasting impression of the birthplace creates a migratory urge for certain species to return year after year to the same place they were born/hatched.

Lesson Objectives: Students will interpret a fellow classmate´s written instructions to draw a unique visual design and place it in a specific habitat. The design will be retrieved by the student who gave the initial written instructions who, at this point, has not seen the design. Students will discuss types of visual cues a migrating animal might use.

Who´s In Danger

Background: Protective coloration or camouflage is an adaptation that numerous animals have acquired over many years of genetic development. It is an effective way to elude predators, especially during migration which is a time of high risk for all animals.

Lesson Objectives: Using a background of solid color, students will predict which colors afford more camouflage than others. Students will then extrapolate this information to see how it pertains to live animals.

RISKY BUSINESS: SACCHARIN, NUCLEAR POWER, AND CROSSING THE STREET IN PERSPECTIVE

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There are many hazards in our world; some are significant, others are not. Because it is not always easy to tell the difference, people have problems putting risks into perspective. We see bizarre behavior such as smokers refusing to use artificial sweeteners, and we see confusion causing some people to throw up their hands and disregarding all risk. Confusion about risk also shows up as outrageous public policy, unbelievable legal decisions, and ineffective risk regulation. We need better ways of dealing with risk than approaching all risk as if it must be reduced to zero. All of this deserves consideration by environmental educators, because many of the hazardous we face are environmental hazards.

Consider the following: we smoke billions of cigarettes per year; but we ban saccharin. We eat fatty diets, while worrying about pesticide residues in food. We worry about dental x-rays and live in houses full of radon. We avoid the oceans because of sharks. Some of us refuse to fly in airplanes, but drive at high rates of speed in automobiles made of glass. People tend to downplay natural hazards--believing perhaps that nature knows best, yet nature is far from benign. The public is likewise likely to overestimate the effect of synthetic things. Many people believe, for example, that pollutants, particularly synthetic chemicals, are responsible for most environmental cancer, when in fact pollutants represent a very small percentage of the risk to cancer (see Kupchella, 1986). Even though there are some carcinogens that are a million times more powerful than others, we have laws like the "Delaney Amendment" that presume that all carcinogens are the same. Legal confusion over risk is exemplified by a case in which a mother who had used a spermicide during the early part of her pregnancy gave birth to a child with birth defects, sued the drug company and was awarded $5,000,000 in a non-jury trial, despite the fact that no evidence existed that the spermicide was teratogenic. The judge was either unaware, or chose to ignore the fact, that fetal anomalies of some sort, severe enough to require treatment, occur in three to seven percent of all humans births, and in two-thirds of these, there are no identifiable causes. Judgments of this type are responsible for the fact that in the last twenty years the number of vaccine manufacturers in the United States has shrunk by more than 50%.

Why do we find it difficult to put risk into perspective and act accordingly? The answer is partly obvious, but it has many dimensions.

First of all, there are many ways of expressing, defining, and perceiving risks. The debate has raged for the last several decades about the safety of nuclear power, and we have often seen pro-nuclear experts vs the anti-nuclear experts: bright, highly educated individuals on both sides citing and emphasizing _different_ statistics to prove either the safety or the danger of nuclear power. Consider the dilemma of a non-expert listening to anti-nuclear spokespersons emphasize what _could_ happen and nuclear power advocates pointing out that few people are killed by nuclear power each year relative to the hundreds "killed by" natural gas. Consider the potential for confusion after hearing about Chernobyl having the _actuarial_ risk of nuclear power compared to crossing the street a few extra times in a lifetime, or raising the national speed limit from 55 to 55.003 miles per hour. The listener also plays a role in coloring risk. Allman (1985) points out people tend to be conservative in taking risks for gain, greatly favoring a small certain gain over a large probable one. People tend _not_ to be conservative when faced with small vs large _losses_, however.

People include things other than the _record_ or the projected number of deaths in assessing riskiness. A _perception_ that one has some personal control over risk seems to diminish the perceived seriousness of risk. We tend to accept the risk that comes with smoking, skiing, and hang-gliding, and have less tolerance for hazards associated with food additives, pesticides, and nuclear power. It is interesting that even _false_ control seems to be a factor. We tend to think _we_ are better drinker-drivers than those who get killed in automobile accidents.

Another reason for the confusion about risk is that risk gets mixed up with benefits. An x-ray adds to one's risk of cancer, but it can bring _far more_ benefit in diagnosis of disease.

Still another problem is that the media distorts risk. The distortion comes in decisions about newsworthyness. Most of us will die of heart disease or cancer, but such deaths rarely make the news. The media would lead us to believe that automobile accidents and serial killers were among the most common causes of death. A few years ago many Americans stayed away from Europe in droves, because of terrorists attacks on airports and suffered far greater risk by living in New York.

There are ways of equating and comparing those risks that we do know something about. One is to express risks in terms of things that would, let's say, increase one's risk of dying by one in a million. Allman (1985) points out that this would equate smoking 1.4 cigarettes, drinking a half liter of wine, and living five years at the boundary of a nuclear power plant. Another way of equating or comparing risks is to look at the estimated average number of days certain habits or actions would take off of a "risk-takers" life. Allman cites the following: being a coal miner, 1,100 days; being 20% overweight, 900 days; and being an unmarried male, 3,500 days.

But not all risks can be placed on such scales. Some risks are unknown and the quantification of some may even by beyond the reach of science. A Committee that studied the biological effects of ionizing radiation III for the Nuclear Regulatory Commission once said, "The Committee does not know whether those doses of gamma or x-rays of about 100 millirads per year are detrimental or not." Straightforward, truthful expressions of this type are not common enough. More often we say we don't know through unintelligible expressions of what might be true given lots of qualification. Others try to make sense out of such expressions, usually by dropping or misstating the qualifiers and make it sound as if someone does know.

Confidence limits become impossibly wide when the risks that they seek to describe are extremely rare. At some point risk assessment crosses into a socio-political dimension. We actually try to deal with risks defined by extrapolation only--risks to small that their effects cannot be observed directly even by animal experimentation.

We have to find better ways to focus on *significant* risks in our society and ignore insignificant ones. Lave and Byrd (1987) suggest that zero risks goals, such as the one expressed in the Delaney clause of the Pure Food and Drug and Cosmetic Act, are unrealistic and, in a world with limited resources to apply to safeguards, impede efforts to deal with significant risks.

Byrd and Lave propose working definitions of both "significant" and "*de minimis*" risk. They define significant risk as risk large enough to be potentially observable. We some adjustment for rare diseases (that tend to be overemphasized by observation). They say that epidemiologically observable increases in death rates occur somewhere between 2 deaths per 100 nd 3 in 10,000. Until someone comes up with a better number, they suggest that a functional lower limit of "significant" might be 1 in 1000--which appears to be a threshold of perceived risk. The upper limit of *de minimis* risk--the limit below which we would ignore risk, they suggest is somewhere just below 1 in 100,000. For risks that fall between significant and *de minimis*, Byrd and Lave suggest that cost benefit analysis should be done to determine the acceptability of a risk.

Although Byrd and Lave´s definitions can, and no doubt will, be debated, and although they leave lots of doubt about what to do about hazards whose range of uncertainty spans both definitions, or when the public disagrees with the experts, regulatory agencies must adopt approaches such as the one they suggest, "perfecting" them as they are being used.

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PARENTS, TEACHERS AND CHILDREN CREATE A RIPPLE EFFECT

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Call it Yankee ingenuity or credit necessity as being the mother of invention but Vermont has invented a low-cost effective way to bring science to thousands of its elementary school children. A rural state with a frugal education budget, Vermont's grade schools, like many across the nation, have suffered from inadequate science programs. Most classroom teachers lack the time, the skills, and the confidence to teach science, having to give top priority to other curricular areas. If we believe that science is important and if classroom teachers aren't teaching science, who can? Parents, that's who.

In 1972, Woodstock parents approached the Vermont Institute of Natural Science to request some training in natural science so that they, the parents, could teach their children. The elementary school principal backed their scheme and ELF was born. Aptly named, Environmental Learning for the Future, this is an environmental/natural science program for elementary-aged children. Over the past 15 years, the Vermont Institute of Natural Science has designed and prepared teaching materials on more than 50 topics, to be used by parents and other community volunteers for teaching science to children in their schools. In Vermont, these volunteers are trained to teach by VINS.

In 1987-88 the equivalent of two full-time Vermont Institute of Natural Science staff disseminated effective hands-on natural science to more than 5,500 children in thirty-five schools each month. This has been accomplished by a simple system, used by VINS for more than a decade. VINS staff travel throughout the state teaching monthly ELF training workshops to volunteers at the local elementary school (or sometimes a nearby church, fire station, or house) during school hours. These workshops are attended by a variety of community people, curious to learn for themselves and willing to volunteer their time to share their learning and their love for nature with children. These volunteers were led through the month's workshops, activity by activity, indoors and outdoors. In effect, they are treated like both adults and children as they watch the teaching being role-modeled, while becoming involved as participants. They learn firsthand how to teach the children and what it feels like to do the activities. How confusing is it to make a snowflake? What are the sensations of being blindfolded?

After the workshop, volunteers gather into classroom teams to plan their presentation to the children, deciding whether to include all activities, who's going to introduce and explain each activity, what materials are needed, and so on. The assembling of materials takes some organizing. Non-expendable materials, such as puppets or murals, are usually made by one person or group for use by everyone; slides or collections (such as skulls, or deer parts) may be borrowed from state fish and wildlife departments or from more local sources; common school supplies are provided by the schools; and everyday objects like winter weeds or shoeboxes are brought from home.

The time actually spent with the children varies greatly among and within schools; it ranges from an hour to an entire day. The role of the classroom teacher varies too. Some get release time to attend the training workshops, some just help the volunteers when they get there, and others do not participate at all.

Review and evaluation of the success of ELF with the children is incorporated into the training workshop by devoting the first half hour of it to feedback from the volunteers. This is extremely valuable, raising issues of teaching techniques, discipline, environmental ethics, and effectiveness of the activities. It also brings forth hilarious stories and helps create a close feeling within the group. (To encourage a friendly atmosphere, we limit the number to twenty-five participants per training workshop.)

The positive aspects of the ELF Program as described above are many. It reaches a broad range of people in each community, increasing their knowledge about the natural world and their awareness of environmental issues. Many volunteers admit that their excitement about what they learn is their prime motivation for becoming an ELF volunteer. It is good for school-community relations, bringing as it does so many community people into the school. It gives children the important message that many adults care about them and about their learning, that nature and science are not confined to a textbook or a classroom, nor dependent on special equipment, experts, and faraway field trips.

While Vermont has some special features that make its system for teaching environmental education both possible and necessary, it is our hope that other regions will be able to adapt the ELF Program for their use. We have therefore published the ELF curriculum in a book called, Hands-On Nature, which is available for $16.95 (plus shipping and handling) from VINS, Woodstock, Vermont 05091.

NORTHERN ALBERTA ENVIRONMENTAL EDUCATION PROGRAM

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Background

The Northern Alberta Environmental Education Program (NAEEP) is planned as a development in three phases of which Phase I is complete and Phase II is well underway. The program developed out of work done in the Fort McKay community in which government (Alberta Environment, Energy Resources Conservation Board, Alberta Forests, Lands and Wildlife), industry (Syncrude, Suncor), and the Fort McKay Band (collectively known as the "Interface Committee"), are attempting to respond to the impacts on the environment and the people made by the major oil sands developments in the Athabasca River Basin.

Alberta Environment funded a small pilot environmental education experience for the staff and students at the Fort McKay School. The project tested response by the students, teachers and community to education programming. Well received by all those involved, the test became Phase I of what is now proposed as the Northern Alberta Environmental Education Program.

The Interface Committee approached the Friends of Environmental Education Society of Alberta (FEESA) to look into the possibility of developing the program. FEESA is a group of individuals, representing all environmental education "stakeholders" committed to balancing differing values and assessing all relevant information from a variety of sources. It is an organization with the freedom to work as a private, fully independent body totally committed to environmental education in its broadest definition. FEESA found groups, companies and government departments that were interested in funding this project. It continues to act as a manager for the project, insuring that the program meets the needs of both the schools and those funding the project.

Purpose

The overall purpose of the program is to help students in Northern Alberta, especially those living in the non-agricultural or marginal agricultural areas. Resource development may seriously impact the physical environment of these students. The program assists students:

--To identify local environmental concerns;

--To identify the potential for both negative and positive impacts to the environment and the students' lifestyles and to define these issues;

--To identify ways and means to responsibly make the students' concerns and interests known to government and industry; and,

--To be able to take responsible action to ensure that the quality of their environment and their lifestyle is not unduly threatened.

Program Criteria

This program would respond to the following criteria:

--Be subject integrated;

--Conform to current provincial education curricula;

--Be developed in consultation with local community and educational leaders;

--Be modular in approach, allowing for a high degree of programming flexibility;

--Be "Monday-morning" ready leaving the teacher with the least amount of preparation possible;

--Address all grade levels, grades 1-9;

--Allow adaptation of existing curricular support resources currently available at no cost from government, industry, and private sources; and

--Be "balance-biased" in approach, addressing all value positions, and responding to all directions and needs of the indigenous inhabitants, recent residents of the area, industry and government.

Program Objectives

A. Students:

1. To increase student awareness of the natural environment and how human activities change that environment;

2. To increase understanding in the students of the "trade-offs" that occur environmentally, economically, socially, and politically when people attempt to change the environment; and,

3. To increase the ability of students to take responsible action on their environment and on environmental issues through education in environmental concepts, problem-solving, decision-making and evaluation of previous actions.

B. Staff:

1. To increase the teachers' ability to implement strategies needed in teaching about the environment and resource development;

2. To increase the teachers' ability to teach using a balanced-bias approach; and,

3. To increase the teachers' ability to adapt available teaching resources in environmental education to their students' needs.

C. Community Leaders:

1. To create an understanding that the role of education is to prepare citizenry who are capable of making informed decisions and taking responsible actions for the benefit of the community and its neighbors.

Program Themes

By using a thematic approach, topics can be addressed through integrating subjects and can be holistic in its dealing with the topic. We suggest that some of the following themes be addressed:

A. Grades 1-3 (Early Childhood Education)

1. All living things have certain basic and other needs, many of which are met by using the environment, and are affected by the environment;

2. The environment is constantly changing. The changes may be due to forces of nature or are the result of the actions and behavior of people.

3. All parts of the environment are related and interact with each other in some way.

B. Grades 4-6

1. Human impact on the environment may be either or both beneficial and harmful. Advances in technology have had positive and negative effects.

2. The special abilities of human beings, which allow them to utilize and control much of the environment, should make them recognize their responsibility toward the care and maintenance of their environment.

3. Humans once selected community sites on the basis of such factors as the availability of good water, good climate, good soil, and means to meet other basic needs. Now development springs up around almost any required resource.

4. Man´s constantly changing and growing need for resources and energy have resulted in:
   a) competition for scare resources;
   b) a search for resources in unexplored areas;
   c) a system-f "trade-offs" being developed; and,
   d) the search for energy-source alternatives.

C. Grades 7-9

1. The environment or the atmosphere sustains life. It is where groups of organisms or ecosystems are formed.

2. Man is a high-order consumer who utilizes the environment to meet his needs and who may influence the environment either positively or negatively.

3. The processing of natural resources may result in positive or negative effects. Production by-products for example, may have unanticipated short-term or long-term impact.

4. People need to become knowledgeable about the changing conditions within the environment in order to analyze information and make sensible decisions about the environment and its problems.

5. Decisions which may influence the environment in some way may be influenced by cultural, economic, social, or geographic factors. Choices between conservation and industrialization will be difficult.

Program Organization

There are many excellent learning resources in support of programs addressing the above themes. Many have been developed in Alberta for use by Albertans, by government agencies, and the private sector. It is the intent of this program to adapt these resources to the needs of students in Northern Alberta.

The basic framework for the program is a focus on the division (grades 1-3, Division I; grades 4-6, Division II; Grades 7-9, Division III) rather than nine separate grades. The time framework allows for modular program development broken into ten one-half day segments, allowing the choice of a one week maximum thematic program. It is assumed, as noted before, that a subject-integrated approach would be used (science, social studies, language arts, mathematics, physical education, and art).

The existing materials then would be adapted to fit these modules and the needs of Northern Alberta students with sufficient opportunity allowed to incorporate local environmental issues.

A core teaching guide for each division level would be developed focussing on:

1. Description of the program's curriculum relevance;
2. Techniques for adapting the materials to grade and ability level and cultural background;
3. Direction on how to identify, gather, and utilize local resources such as field experiences, topic experts as presenters, measuring local opinion/need, etc.;
4. Direction as to how to obtain relevant resources from government agencies, and the private sector;
5. Techniques on how to identify value positions, bias, and opinion in materials and how to use these as valuable learning resources; and
6. Description of the environmental education process (awareness to action) and how to apply it.

THE CHALLENGE OF PUBLIC OPINION POLLS AND PUBLIC ILLUSION

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ABSTRACT

The Quebec Union for the Conservation of Nature brings together over sixty groups working in the area of conservation in Quebec. Formed only in 1981 and growing rapidly, it is the largest organization covering the broad spectrum of conservation issues in the province.

This fact underlines a problem. The public is presumably no further advanced than the organizations which represent it. It seems safe to conclude that the population is therefore very new to issues related to conservation. Nonetheless, public opinion polls (fall 1985, winter 1987) repeatedly suggest that environmental concerns rank high to very high. Part of this relates to the role played by the media in highlighting certain events and certain issues. Part of it is perhaps the result of the growing number of groups in the field.

Fundamentally, however, the polls are misleading, and suggest orientations for future work in environmental education directed to the general public. These relate to fundamental issues associated with natural resource use and "consumer behavior", to societal infrastructures in relation to resource use, and the loss of territorial control with respect to environmental degradation.

The ultimate objective of this work is to achieve greater influence on political action at all levels. The major challenge is probably to bring about awareness of long-term problems while respecting the interest of the media and of decision-makers in "current events".

LE DEFI DES SONDAGES PUBLICS POUR L´EDUCATION ENVIRONNEMENTALE ILLUSION ET REALITE

De facon générale, tels que reportes par les medias, les résultats de plus en plus frappants des

sondages dans le domaine environnemental obligent les éducateurs--scientifiques, activistes, journalistes-- a réfléchir serieusement a la situation. Il semblerait possible de croire que l'éducation environnementale a reussi de façon inespérée. Néanmoins, force est de constater que ces résultats ne reflètent pas du tout la situation "sur le terrain".

Pendant cette période de la "réussite" de la "sensibilisation", l'état de l'environnement s'est degradé. La consommation qui est a la base de la dégradation a surement augmenté. L'utilisation de plastiques non renouvelables et non recyclables s'est accrue, de même que celle du papier, renouvelable et recyclable seulement en principe encore aujourd'hui. Le problème sous-jacent des déchets domestiques et industriels est devenu la preoccupation principale et réelle de nombreux maires et ministres. A travers l'Amerique, l'agriculture s'est tranfsormee, adoptant des pratiques plus dommageables que les anciennes. Tout cela sans parler des pluies acides, de la couche d'ozone, de la perte des habitats....

L'ecart important entre les perceptions du public et le comportement de ce meme public, qui continue a augmenter ces problemes, et cela de facon accelerée, suggeré qu'il faut s'interroger sur les objectifs de l'éducation environnementale. Il y a raison de croire que le public, tout en entant au courant de l'information fournie par les medias quant au piètre état de l'environnement, n'en connait pas les veritables causes de la dégradation. Si cela est vrai, l'éducation doit nécessairement viser une sensibilisation plus approfondie, portant sur la résponsabilité de chaque individu dans cette dégradation, et par implication la résponsabilite du secteur privé.

Les travaux et le rapport de la Commission mondiale sur l'environnement et le développement (CMED) ont mis un accent sur de nouveaux engagements de la part de tous les intervenants. La Commission, formée en grande partie de politiciens, a fini par reclamer un développement plus approprie et plus juste, comme la seule solution aux problèmes environnementaux. Au Canada, le Comité canadien de ministres des ressources et de l'environnement (CCMRE) a rendu plus explicite la portée du travail de la CMED, reuissant dans son groupe de travail sur la question des représentants du public et du secteur privé.

Un autre volet de la problématique de l'éducation environnementale contemporaine revèle une situation dramatique a cet égard. Selon un sondage effectué pour la Canadian Chemical Producers Association, la moitié de la population considere les bénéfices de l'industrie chimique aussi grands que les risques, même si ces derniers sont très élevés.... Dans ce cas, en contraste avec la situation qui prevaut dans d'autres domaines relies a l'environnement, le public ne manque pas de connaissances quant aux causes de la dégradation mais est prêt à vivre dans une société a haut risque.

Il faut présumer, dans le contexte de la problématique de l'éducation environnementale, qu'une telle société accepte les risques parce qu'elle ne voit pas les moyens de les diminuer où de les éliminer. Le manque de connaissances est donc a un autre niveau.

Il n'est pas prioritaire maintenant de "sensibiliser" la population aux dangers des nombreux impacts environnemtaux. D'ailleurs, la notion même de "sensibilisation" comporte justement la superficialité qui est à la base de l'écart entre les perceptions et les prises de décisions du public.

Il faut donc proceder donc avec un nouveau réalisme. Les mêmes personnes qui perçoiveut l'utilisation de produits chimiques ou de pétrole comme dangereuse se plaignent lorsque le prix de l'essence monte--et les sondages le demoutreut rigoureusement--et choisissent naturellement, par une sorte de paresse que tout le monde connait la porte des vidanges plutôt que celle du recyclage.

En effet, la bourse et la facilité sont a la base d'un très grand nombre des decisions quotidiennes. La conclusion qui en découle est que les individus vus comme consommateurs, d'une part, et les industries elles-mêmes, de l'autre, sont les vraies cibles prioritaires de l'éducation environnementale.

Les industries sont directement responsables de l'extraction ou de l'exploitation des ressources naturelles outre leur capacite régeneratrice, du commerce et du transport qui dominent les paysages la ou l'extraction et l'exploitation ne dominent pas. Les consommateurs de biens et de services definissent les infrastructures urbaines ou la vaste majorité d'entre eux vivent, infrastructures dont les incidences environnementales sont phénoménales.

Un facteur important dans l'établissement de priorités est que le public, meme sensibilisé, ne constitue pas un bloc de "single-issue voters" et l'appui politique enregistre par les sondages n'est pas aussi fort que suggère.... Ceci contraste avec l'attitude associée aux objectifs économiques fondamentaux, comme le controle de l'inflation et du chomage. Il ne faut donc pas s'attendre a des changements par le processus politique.

Dans le contexte de ces commentaires, la clé dans l'application des priorités en éducation environnementale proposée ici est la capacité de bien cerner les problèmes environnementaux d'un proche avenir.

Les industries semblent ouvertes à un dialogue lorsqu'elles peuvent entrevoir un problème à moyen terme, que cela soit un manque de rentabilité de leurs produits du aux problèmes environnementaux qu'ils causent, une repudiation de leurs produits provenant d'alternatives et meme de boycottage, ou un manque de ressources premières du a une règlementation ou a une rareté.

La population, quant a elle, est "sensibilisée" et prête a agir lorsque des solutions rentables, voire nécessaires pour des raisons économiques, seront proposées. L'ignorance du rôle de l'individu dans la dégradation environnementale ainsi que la paresse et l'égoisme de celui-ci lorsque confronté par son comportement de tous les jours définissent les éléments dont il faut tenir compte en visant ce pôle du problème.

Un problème avec cette approche est qu'il exige des organismes non gouvernementaux en cause, entre autres, une compétence et une implication qui dépassent les capacités de la vaste majorité d'entre eux.

MAKING THE CONNECTION: ESTABLISHING ENVIRONMENTAL CENTER/SCHOOL PARTNERSHIPS

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When considering school relations, there are two major problems which face environmental educators. (In this paper, the term "environmental educator" will apply to educators at nature centers, zoos, museums, and other natural history-related facilities.) The first is that classroom teachers and environmental educators rarely talk with each other about how they can best collaborate given their separate missions and resources. The second is that many environmental centers (likewise, the term "environmental centers" will apply to the above mentioned facilities) offer few or no programs for secondary school students.

The Naturalist Center at the Smithsonian Institution's National Museum of Natural History had failed to consider these two issues prior to 1984. At this time it recognized them as problems and began working with one earth science and two life science teachers who were already familiar with the Center and recognized its tremendous educational potential. The Center's staff invited the teachers to come in and explore how they could use the facility's collections, books, and equipment with their students. The teachers described the concepts and topics they taught in their classrooms and together, the staff and teachers developed three hands-on activities for students and a 16-hour summer workshop for teachers. Due to the success of the first workshop, the Center received a grant to present the workshop nation-wide.

The national workshop project served as a model for how secondary school systems and environmental centers could collaborate in developing educational programs which meet teachers' curriculum needs and use the various centers' resources. Although the project dealt specifically with the natural sciences, the principle ideas taught were applicable to other disciplines (such as art or social studies) and other facilities. It is important to note that the workshop project could not have been a success without the continuous input and suggestions of teachers.

The Naturalist Center is a public research area containing over 25,000 specimens representing the major scientific disciplines at the museum. Reference books and scientific equipment such as scales, balances, and microscopes are also available to the visitor for further exploration of natural history specimens and topics. The lay out of the Center, with its storage cabinets filled with specimens arranged taxonomically, simulates the "behind-the-scenes" areas where the museum's scientists work. The types of activities engaged in by students are similar to the research activities of the curators and technicians.

The Outreach Workshop

A typical 16-hour workshop involved ten environmental educators who each brought two secondary science teachers from their local areas. Through several activities, teachers learned some ways that their local centers could be used for teaching environmental science. Teachers came to the workshop with a list of topics and concepts they taught to share with the environmental educators. In turn, the environmental educators shared with the teachers what resources they had available for possibly teaching those topics and concepts. Any questions that the two groups had for each other could be addressed and answered immediately. A discussion on learning styles determined how the workshop participants tended to learn best and helped them understand that there are many different learning styles which they might strive to accommodate by offering to students a variety of learning experiences. The end result of the workshops was that in learning about their local centers, teachers became encouraged to branch out into their communities and not rely so heavily on lecturing and the textbook.

Helping teachers become more aware of object-oriented teaching methods was perhaps the most beneficial aspect of the workshops. The skills associated with object interpretation are usually not part of the classroom teachers' repertoire. Encouraging teachers to go beyond lectures, tests, and textbooks and learn how to interpret objects can be a crucial element in the improvement of science and environmental education. As one teacher stated:

> We as teachers were learning skills that we talk about so much when we talk about the scientific method. We were actively involved with the process of science...

The communication that occurred during the workshop was clearly needed and appreciated. As one environmental educator stated,

> The exchange of information gave me a better idea of the constraints faced by teachers in taking field trips and in attempting to deviate from the textbook. I feel I can now develop ways to be more accommodating to them.

Programs Resulting from the Workshops

Teachers and environmental educators from several of the national workshops have developed teacher advisory boards which meet several times a year to brainstorm and develop new ideas for developing teacher workshops, teacher resource centers, and education programs.

Throughout the workshops, teachers suggested ways that the environmental educators could help them use their resources and programs most effectively. The main topics they brought up were: improving publicity efforts, improving programs, and providing more teacher training. (For a complete list of the suggestions, contact the author.)

Since attending the workshops, several teachers have used the hands-on activities introduced in the workshops. Students have collected specimens to use for the exercises or teachers have borrowed specimens from their local natural history museum or nature center. Several teachers commented that they are using more inquiry techniques in their teaching and that they have learned that museums, nature centers, and other similar facilities are excellent resources for materials and ideas. Individually, two teachers (one from New Mexico and one from Texas) each received grants to develop mini-museums in their classrooms. Both teachers gave presentations at regional science teacher conferences on developing classroom museums. Several teachers have presented in-service training for their district teachers on implementing hands-on activities into the classroom.

A group of teachers and environmental educators in the Albuquerque area developed a high school course, "The Natural History of Albuquerque" while a similar group in New Orleans organized a "Resource Day" at which teachers learned about the educational offerings at their local centers.

An educator from the Houston Museum of Natural Sciences redesigned his education programs to include more hands-on inquiry activities. He commented:

> I think one of the failings of science education has been the lack of stimulating creative thinking and problem solving skills. We have begun to limit class size in our museum programs and I'll be able to expand the use of the lessons we developed at the workshop.

Summary

Environmental educators and teachers need to meet on a regular basis to become more aware of each others' constraints and responsibilities and to develop effective education programs which tie in with curriculum requirements. As one educator stated,

> The exchange of information (at the workshop) gave me a better idea of the constraints faced by teachers in taking field trips and in attempting to deviate from the textbook. I feel I can now develop ways to be more accommodating to them.

Most classroom teachers are bound by a system that emphasizes memorization of facts and terms in preparation for college admission tests. This prevents them from helping students learn the essential problem-solving and critical thinking skills they need now and in the future for making important decisions in their personal lives as well as about political and environmental issues.

Environmental education centers and other similar facilities have the advantage of being curriculum-free and thus can offer an informal learning atmosphere where students can go beyond the textbook and be free to explore and discover on their own. Environmental educators should make a concerted effort to work closely with teachers in developing inquiry activities whereby students can use objects for brainstorming and synthesizing ideas and concepts at their own paces.

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THE SEARCH PROGRAM IN CONNECTICUT

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What is Search?

Environmental education is alive and well! As time goes by and we leave the 1970s and the old good earth days to approach a very different era, our ideas and methods of teaching environmental education have to change.

There is a logical sequence of steps that have to be followed to complete the goals and objectives of a good environmental educator. We first introduce young children to the world of DISCOVERY. Here we work with our senses to learn to appreciate our environment. Lessons in which we feel, touch and look at our surroundings are used. Once we have introduced our students to a world of discovery, we introduce CONCEPTS in the environment. Here we start to understand "the why of things," and we can interconnect different parts of our discoveries. The next step in Environmental Education is to provide a setting for MEDITATION for the students. Meditation will introduce the students to critical thinking. Most of these concepts are introduced in upper elementary and Junior High School. Students will soon realize that good critical thinking can not be accomplished without FACTS. The knowledge of factual information is crucial for anyone who needs to make a decision. The final step is ACTION. This is the time when our students will work toward solutions of current problems and the prevention of new ones. This is where SEARCH comes into play.

Search was developed two years ago to provide high school students in Connecticut with the opportunity to search for solutions by using scientific research and reasoning. The results are published and available to the public. Search programs in the past have dealt with vegetation surveys, water quality analysis and forestry studies.

Who are the Students for Search?

The best students for this type of project are those that are eager to learn and are motivated to spend many hours in the field, the lab and the library. Gifted students often fit these qualifications but taking only gifted students may discriminate against those students that may not have been labeled as such. These students often are willing to do the work and can do it. Many times students are interested in environmental problems, have the necessary qualifications but may have learning disabilities. These could be overcome easily with the use of computers, extra help or just individual attention.

Many high schools do not have gifted programs. Students can then be drawn from the upper classes and from the college bound courses offered in the school.

Some simpler projects may be accomplished with students from upper elementary school or junior high school, but these projects should not require much prior knowledge. Students from high school, specially juniors and seniors, do the best jobs.

Project Parameters

There are six parameters that every project should meet. These parameters are:

--The project should be pertinent to the students and to the community.

--The study should not be subjective. It is important not to take sides before the project starts. The objective is to find out the truth using scientific reasoning.

--Every project should involve other organizations in the community or the town or state government. Students should work together with organizations such as town councils, private enterprises, watershed councils etc.

--Students at the young age may not be as accurate as we would wish them to be. The project should allow for a standard error, that will not greatly modify the results.

--The project should involve class, laboratory and field work. The students should be involved in an authentic experience.

--The persons doing the coordination and giving the technical assistance should be qualified to do the research on their own. The research should be of the highest standards.

Doing the Project

There are several suggestions that can help to get a particular research project accomplished. These are:

--Students should meet at least twice a week to work together on the project. The coordinator could meet with them only once every week.

--A guest speaker is one way to provide the students with the necessary information that they may need later on. The introduction of a speaker could also bring the community closer to the project. It is very important for those students to hear local professionals.

--Depending on the difficulty of the research, it is better to seek advice from people in the field who have experience with the problems. There is no reason for spending time and effort re-inventing the wheel.

--Most students at that age can not be left on their own. They feel lost and without direction. It works better to have the students assign themselves responsibilities and to meet a certain schedule.

--We live in a world of computers. Most research projects can use the aid of a good computer. Don't miss the opportunity to introduce the students to the world of modern technology.

--Field work and field trips are very important. This is probably the most exiting part of any Search program. Get your feet wet, remember to consider safety and make your field trips interesting.

--Once the field work is done, data and results can be provided through lists, graphs and maps. Use every possible way to make the data as descriptive as possible so it can be discussed by the group.

--Conclusions are the most difficult part in any Search project. Students may not be ready to establish conclusions. This may be due to insufficient knowledge of the problem, lack of maturity, lack of time, not enough data, etc. You may not be able to provide conclusions, but you may be able to provide a forum to brainstorm. Make sure the conclusions are correct. Watch out for premature conclusions. Many scientist make that mistake. It is fine to just provide data and to state that you don't know.

These few recommendations, plus all the new brilliant ideas you can put into a Search program will make it a success. Publish the results. One way to do this is by printing your own Search publication. Print one publication for every research project you do. Publishing material such as research projects provide the students and the community with a permanent record of the results. Make one master copy and produce xerox copies when needed.

Search in Connecticut has proven to be a success. Students who have enrolled in the program have had the opportunity to experience a taste of a profession. They have had the opportunity to interact with their community. They have worked as a team. They have shown responsibility, learned new skills. I have found it personally gratifying to know that many of the students after high school graduation have chosen to follow carriers in the environment, such as natural resources, biology, environmental law, etc. Career choices will be monitored more closely as more and more students in Connecticut graduate from high school.

Search is a new idea. It is based on the philosophy that as educators we should provide the tools and the opportunities to students to excel to their maximum. I know adults that believe high school was a waste of time, just a chance to socialize. Books and theory, no real world. Search provides a niche for a broader opportunity. Some students will take it and some will not.

INTERACTIVE ROUGE RIVER WATER QUALITY PROJECT

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The Interactive Rouge River Water Quality Project is an educational project that focuses on water quality of the Rouge River at the community and high school level. Science teachers and their students from sixteen Detroit area high schools participated in this project that merges water quality monitoring with a computer communication network. The high level of pollution in the Rouge River's four branches and the need for community awareness and concern in clean-up efforts gave the project a sense of being part of a community effort.

The Rouge River is an urban river. Its four branches: Main, Upper, Middle, and Lower drain a watershed that is 60 percent urbanized. Within the 465 square mile watershed live nearly 2 million people. The extensive urbanization resulting from this densely populated area coupled with an aging combined sewer system was the source of tremendous loads of untreated sewage to the river. A combined sewer system is designed to carry both stormwater runoff from streets and parking lots, as well as sanitary waste from homes, schools, and businesses to the wastewater treatment plant. The present sewer capacity is inadequate to handle the increased urban runoff; consequently, untreated sewage is shunted into the river to avoid flooding the system. Untreated sewage, variations in flow, and the natural character of the river have left a legacy of thick mats of sewage covering the river bottom, low dissolved oxygen levels, contaminated sediments, and massive log jams from undercut trees along the river.

The Interactive Rouge River Water Quality Project arose out of a realization that the river had been abused and neglected for too long. Friends of the Rouge, a nonprofit community organization sponsored this project as an effective way to involve young people in their communities, to mobilize media attention on the river and its problems, and to nurture concern and awareness in young people towards the river. Students and educators from the University of Michigan, School of Natural Resources received funding from Friends of the Rouge to apply their knowledge and experience in designing the model for this project.

This paper seeks to describe the process followed in the planning and implementation of Phase One of the Interactive Rouge River Water Quality Project.

Phase One

Phase one of the project comprises two major content areas: water quality monitoring and computer networking among the high schools. The process followed in the identification and selection of participants, the hands-on experience with sampling and water quality testing, and the sharing of data and perceptions of water quality at the end of the project are described below.

The project began with the formation of a Rouge River Education Advisory Committee made up of teachers, curriculum coordinators, environmental professionals, and Friends of the Rouge staff. The purpose of this group was to bring forth names of teachers who were interested and had some experience in water quality studies, and also to help guide the project. Prospective teachers were sent "Letters of Agreement"; this letter described the project, listed the responsibilities expected of participating schools (including time commitments), and listed the resource to be provided by Friends of the Rouge. The teacher and the principal signed off on the letter, as well as Friends of the Rouge thus opening the way for further planning and work.

Each of the sixteen teachers selected were then invited to a Teacher Planning Session. In this session, the plan for the project was outlined. Teachers, with the help of facilitators, were asked to respond to the plan and to offer suggestions for tailoring the plan to meet their needs. Out of these small groups emerged concerns about needed water quality testing equipment, about expertise in using computers, concerns about student safety, and about the workability of the project. The concerns and ideas voiced by the science teachers were incorporated into the design of the Spring Workshop.

Spring Workshop

The purpose of the Spring Workshop was to offer teachers and at least two student representatives from each high school an opportunity to interact and to work in groups learning correct sampling and water quality testing procedures and to learn how to access and use Confer II, the computer networking program.

Water quality testing in this project employed the National Sanitation Foundation's Water Quality Index. The Index comprises nine water quality parameters: Dissolved oxygen, fecal coliform, pH biochemical oxygen demand, temperature, nitrates, total phosphorus, turbidity, and total solids. Data collected from these nine parameters is applied to a weighted curve for each parameter; this value is then used to derive a Water Quality Index, a single number representing overall water quality. Students from the University of Michigan trained in the correct testing procedures and the significance of these parameters worked with teacher groups at the workshop to ensure that teachers could run the water quality tests accurately and safely. Concurrently, student representatives met as a group in a computer lab to learn how to access and to use Confer II. In Confer, the computer used by participants was hooked into a telephone line via a modem. Students "dialed" the University of Michigan mainframe computer; messages were sent in a split-second to the mainframe computer and these messages were sent to whoever was to receive the messages.

The Spring Workshop readied the teachers and students for the water quality monitoring program in early May.

Water Quality Monitoring Program

This two week intensive period was designed to ready students for water quality monitoring over the first week and to compile, graph, analyze, interpret, and share water quality data over the second week.

The First Week. The beginning of the week was used as an orientation to the Rouge River watershed: where the river flowed in relation to their community; what communities were located upriver and downriver from the school; and what were some shared water quality problems throughout the Rouge River. A slide-tape presentation, a videotape, and a map of the Rouge River were produced for this project. The slide-tape presentation provided a good overview of the watershed, and the videotape highlighted citizen action.

Students worked in small groups, along with university facilitators, to learn accurate and safe water quality testing, to understand the significance of water quality parameters to overall water quality, and to understand interrelationships among parameters. Students became an "expert" in the running of at least one water quality test and became responsible for running that test at the river monitoring site. On a common day each of the sixteen high schools traveled to their monitoring site and ran the nine water quality parameters; often, these sites were close to the school and some sites were designated monitoring sites for the Michigan Department of Natural Resources.

The Second Week. During this week, student teams derived a Water Quality Index from the data collected. Both the raw water quality data and the Water Quality Index for each high school were entered into Confer and shared among the schools. Many high schools chose to illustrate the data collected in graphic form through a computer graphing program, or by generating graphs by hand. Towards the end of this week, students analyzed their water quality data in reference to data collected upriver and downriver. Students generated questions and possible theories that could explain the changes they noted in particular parameters and in overall water quality. Thinking critically about the water quality data helped to prepare two to five students from each high school to attend the Rouge River Student Workshop.

Rouge River Student Workshop

The Student Workshop held at Redford High School in Detroit brought together each of the teachers, some students from each school, and water resource professional from the Michigan Department of Natural Resources, the International Joint Commission, National Wildlife Federation, Clean Water Coalition, Friends of the Rouge, School of Natural Resources, and the State Water Resources Commission. The three key questions addressed at the workshop were:

1. Why does the data collected for the nine water quality parameters change from the headwater regions of the watershed towards the mouth?

2. What are the probable causes or sources of problems as reflected in the water quality data?

3. What are some actions that could be taken on the individual and institutional level to help reduce or eliminate water quality problems?

In the morning, students gathered into four groups based on the branch of the Rouge River that they monitored: Main, Upper, Middle, and Lower. The key questions above were addressed in these groups. Teachers met with the project coordinators to talk about the project, share different approaches, and to voice constraints that were encountered. Before the entire group, each "branch" identified shared water quality problems, probable sources of these problems, and offered some possible solutions.

In the afternoon, students focused on how to affect change, this time dividing into groups based on the issues of concern: pollution solutions, beautification and cleanup, and public involvement and publicity. Ideas from this session fell into individual and institutional change. Students brought forth issues of land use, economics, recreation, and public involvement as these related to water quality. This workshop brought out the complexity in dealing with environmental problems and underscored the need for an interdisciplinary approach to the problem; this set the stage for phase two of the project to include social studies classes in these schools. Already schools from India, Australia, West Germany, and from Denver and Seattle are undertaking similar water quality projects thus opening the potential for sharing of approaches to solving water quality problems across national and international lines.

NOTE: The project described in this paper developed from a model formed in the Huron River watershed; this model is discussed in a paper published in the NAEE 1985 Proceedings.

THE STATUS OF FORMAL AND INFORMAL OUTDOOR/ENVIRONMENTAL EDUCATION (O/EE) IN SASKATCHEWAN: 1986

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Executive Summary

A major survey of formal and informal outdoor/environmental education (O/EE) in Saskatchewan had never been done. Four Canadian survey documents plus the experience of an advisory committee and the author were used to design the questionnaires for formal and informal educators.

Many dimensions of O/EE were assessed. The formal sample (schools, colleges, institutes, universities) had 28.1% returns (410/1490), while the informal sample (centres, government civil servants, non-government organizations) had 55.1% returns (52/94).

Main responses/results were as follows:

A. Formal--Environmental Education (EE)

- --most respondents were school teachers (K-3 and 10-12)
- --they taught EE by integration and using field trips
- --the more abstract concepts were stressed (e.g., values/attitudes)
- --observation was a key process
- --key instructional strategies were discussion, field trips, and AV aids
- --many Saskatchewan developed materials were used plus SEEDS and PW
- --key resources were AV and field sites
- --much inservicing (training or professional development) is needed
- --the universities, Saskatchewan Environment and SOEEA should provide the training
- --previous training has been poor
- --there are many key EE issues in Saskatchewan (see Table 45 taken from the full report)

B. Formal--Outdoor Education (OE)

- --most OE materials are teacher prepared
- --the classroom teacher shows the key leadership
- --nature study and camping are among the key OE pursuits
- --schoolyards and parks are used the most
- --several trips yearly of short duration at no/minimal cost seems to be the rule
- --money is raised via fees and projects
- --outdoor group size varies
- --walking/hiking and the car are the most used for outings
- --teachers receive no/few considerations for OE trips
- --there are many obstacles to doing OE

C. Informal

- --most respondents were civil servants
- --they use presentations and publications
- --values/attitudes and environmental problems are key concepts
- --the top strategies and resources used are identical to the EE group (see above)
- --various materials are used
- --interpretation and environmental problems/issues are the main pursuits
- --most excursions are done in summer
- --environmental issues (see Table 45)
- --issues are resolved by education and lobbying
- --environmental literacy should be increased through the schools, the media, and by direct experience.

The analysis and discussion of the results left many unanswered questions.

Over 40 recommendations, mainly Saskatchewan-specific, were sub-divided into the following categories (number per category):

- --General (6)
- --Training & Instruction (15)
- --Materials & Resources (11)
- --Administration (7)
- --Informal Education & Information (3)

Who should be responsible for facilitating the completion of these recommendations? The recommendations were coded and the following groups were suggested for the follow-up: SOEEA; other Non-government organizations; the universities; other training institutions; teachers' and trustees' groups; government departments; nature/outdoor centres.

Once the full report or its summary has been circulated, then the actual task of trying to translate the recommendations into action will begin. Only then will its usefulness be realized!

TABLE 45: KEY ENVIRONMENTAL ISSUES

ISSUE	FORMAL RANK	INFORMAL RANK
Conservation	1	5
Land Use	2	3
Pesticides	3	4
Agriculture practices	4	1
Wildlife habitats	5	2
Toxic chemicals	6	7
Energy (non-renewable)	7	10
Acid rain	8	13
Water pollution	9	10
Lifestyle of people	10	11
Water management	11	7
Endangered species	12	8
Economy and the environment	13	6
Forestry	14	9
General (all of these)	15	10
Energy (renewable)	16	17
Provincial parks	17	14
Potash mining	18	17
Hunting	19	17
Recycling	20	17
Urban sprawl	20	16
Environmental assessment	21	12
National parks	22	15
Automobile emissions	23	18
Other	24	15

PROJECT WILD IN CANADA

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Project WILD is an interdisciplinary, supplementary, environmental and conservation education program emphasizing wildlife. The goal of Project WILD is to assist learners of any age in developing awareness, knowledge, skills and commitment to result in informed decisions, responsible behavior, and constructive action concerning wildlife and the environment upon which all life depends.

In Canada, Project WILD is sponsored by the Canadian Wildlife Federation (CWF). The Canadian Wildlife Federation is a national, non-profit, non-governmental conservation organization representing 540,000 members.

The concept and development of Project WILD originated in the United States by the Western Association of Fish and Wildlife Agencies in agreement with the Western Regional Environmental Education Council (WREEC). In 1982, CWF became an associate organizational sponsor of Project WILD, entered into an agreement with WREEC and acquired the Canadian rights to the program.

The Federation's decision to sponsor Project WILD was based on its perception that a major wildlife education program was needed in Canada. CWF responded to this need through a commitment it made in the late 1970s at the Federal-Provincial Wildlife Conference (an annual conference of federal, provincial and territorial government directors) to produce a quality conservation education program in both official languages (French and English) for application throughout Canada.

In a search for models of programs, Federation officials became aware of and involved in Project WILD in the early 1980s. The impressive quality and scope of Project WILD, its value-fair approach and the fact that associated teaching materials were designed to enrich the existing school curriculum were key considerations in the decision to adapt Project WILD into a Canadian conservation education program. An added benefit was the opportunity to further mutual educational objectives and interests in a North American context.

Once the CWF became Canada's principal sponsor of Project WILD, the Federation's first task was to develop a Canadian program and test its feasibility. It was decided that the Canadian program would initially focus on a target audience of elementary level educators and feature Canadian editions of the Project WILD Activity Guides. In 1983, the Canadian program was launched with a pilot project that was conducted successfully in cooperation with the government of Alberta's wildlife department. In 1984, a formal submission was made to the twelve Canadian provincial and territorial wildlife government departments inviting them to participate as sponsors. By 1985, the CWF produced and published the first edition of the Canadian Project WILD Elementary Guide with a second revised edition released the following year. In 1986, the development of the Canadian French language Project WILD program was initiated. That same year, the Federation also became involved in the Aquatic Supplement--an addition to Project WILD which features aquatic wildlife and habitats.

Project WILD is implemented in Canada through sponsoring government wildlife departments. Departments of education are involved in various capacities through mutually acceptable arrangements between wildlife and education officials. At present, seven of the twelve jurisdictions have become formal sponsors from the following provinces: Newfoundland-Labrador, Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. At least two of the remaining five jurisdictions, namely Prince Edward Island and the Yukon, expect to join within the next year.

Introductory workshops on the use, application and philosophy of Project WILD are required as the mechanism through which educators are introduced to the program within each sponsoring jurisdiction. Teaching materials associated with Project WILD are distributed only through these workshops at no cost to the educator. To date, approximately 13,000 educators have participated in this program.

In the year ahead, the Federation will be formally launching its French language Project WILD program. The development of a Canadian Aquatic supplement of a Canadian Aquatic supplement is also planned for 1988 for release in early 1989 in both official languages.

Workshop monitoring, evaluation and statistical record-keeping and processing at the national level are coordinated through and maintained by the Federation for feedback purposes. "Participant Survey Forms" completed by participants at the conclusion of workshops are used at present as the sole source of data collected for these records. A "Survey of Use and Needs" similar to the U.S. Survey for Project WILD, is currently under consideration for implementation in the near future.

NEW APPROACH, NEW CHALLENGE

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Since September 1982, a mandatory Science course was incorporated into the curriculum of the students of the Province of Quebec. This particular program entitled "Ecology" with the official code number 16-3143-01 (16-3143-01A), was developed by the Direction des Programmes of the Department of Education.

What Brought About the Need for an Ecology Course?

The sixties were a time of great social and political expectations. Indeed, the need dates that far back. The Royal Inquiry Commission responsible for bringing in the Parent Report, made it known:

--that, henceforth, science courses were to include field trips;

--that teachers were to use a more dynamic and progressive approach;

--that young people, because of their inquisitive minds, were to be directed toward organized scientific research;

--that the students were to be inculcated with a solid basic knowledge of the general theories and principles of the sciences;

--that students, at an early age, were to be made aware of and be directed towards scientific careers.

It became evident at the beginning of the seventies, with the advent of the energy crisis, the findings of such eminent organizations as the Club of Rome, IUCN, UNESCO and from studies made by illustrious human behavior observers that, to cope with the imminent and mounting problems and perils facing the environment, young people had to receive an adequate formation, through pertinent courses offered within the school curriculum.

People also saw, at the local level, the need for a scientific formation of the young. Educators, particularly secondary II high school teachers, were looking for a science program which would arouse within students a desire for an education geared toward science. (Not many students at that particular time opted for chemistry or physics courses.)

An Ecology Course is Proposed

In the seventies, therefore, taking into consideration the needs of the world in general and the specific expectations of educators, a group of high school teachers devised a program for 12-13 year old students, which they proposed to the Department of Education of Quebec. These same teachers were asked to elaborate the program, thus giving it the present orientation with its special objectives. This program was favored from the beginning because it encouraged:

--discovering the immediate environment;
--acquiring self-knowledge;
--favoring an ethical, social development.

This program was also favored because it fulfilled the expectations and the needs of the students themselves. The acquisition of new knowledge obtained through personal experimentation during pedagogical activities, would equip them adequately in their quest to improve their own environment.

The Overall Objective and the Goals of the Ecology Course

It is obvious that the present state of the environment requires a change of attitude within our society. A philosophy of conservation must gradually replace heedless consumption.

The present program enables teachers to dispense a science course which is less structured than were the former lecture-type zoology and botany courses. The teaching of the ecology program is concerned with the education of the whole person. It involves not only the student's intelligence but his emotions and will as well. The purpose of this course is not to condition the student, but to help him build a new system of values which will help him to achieve the overall goal of the course that is:

--to familiarize him with basic ecological knowledge and the skills associated with this knowledge;

--to instill in him working methods that will foster the progressive development of logical thought;

--to encourage him to develop positive attitudes toward himself, other people, and his environment;

--to foster intellectual discipline and self-confidence;

--to develop an understanding of nature and a sense of curiosity;

--to enable the student to perceive his environment in a more realistic way and with greater awareness and commitment.

Even if the 12-13 year old student has not yet fully matured, we took into account his imaginative potential, as well as his need for continual change, thus providing him with scope to show his resourcefulness while working within a group of some 30 students.

The Content of the Program

In order to maintain a link between elementary school programs and those of the first year of high school, this program uses objectives that will develop the student's knowledge, skills and attitudes. In other words, it aims at bringing changes in performance and behavior. In keeping with the philosophy of the program, one of the first terminal objectives suggests that students should be encouraged, from the start, to understand phenomena and their interrelation with the broader environment. Students should develop a pattern of conceptual thinking that will enable them to perceive the essential characteristics of phenomena. The role of the teacher is to make the students understand the phenomena and their interrelation if they are to understand and support conservation programs. In a given environment, everyday-life involves interaction among a whole range of phenomena. This interrelation is not always obvious to the casual observer, but it can be discerned through careful observation. Most people are only aware of a small number of the phenomena that surround them. Their lack of knowledge of the interrelation between living things and between living and non-living things makes it difficult for them to understand the forms and functions of the environment. This becomes obvious when observing beginning students studying a chart, viewing a movie or sight-seeing during a field trip. It would seem that it is more difficult to make a descriptive statement about an individual tree than to describe the forest as a whole. Our approach with its emphasis on the development of skills, teaches the students to solve concrete problems on their own, during their learning activities. This method of teaching enables them to develop a spirit of scientific inquiry through first-hand practical experience. This approach, we believe, will best enable the students to become aware of the problems facing the environment.

Was Our Choice a Good One?

In May 1986, five years after the implementation of the program, the Department of Education of the Province of Quebec (MEQ) decided to evaluate this new program.

The information obtained would serve to determine:

--the caliber of the program and its implementation;

--the results obtained by teachers in its application;

--the teaching conditions encountered and the methods used;

--the degree of achievement obtained by the students;

--the degree of satisfaction experienced by those who used the program.

In this survey, questionnaires were sent to teachers, school principals, pedagogical counselors, and directors of instructional services--from the various school commissions--as well as to students and their parents, to determine their level of satisfaction with the new program.

From the 11 regional sectors of the Quebec Province, 155 schools were chosen at random. In each of the chosen schools one teacher was picked, again at random, to answer the questionnaire along with 3 of his/her students. In all, 452 Secondary I students, out of a possible 86,176, took part in this evaluation program.

It would appear, from the results obtained, that all those who had taught the new program were in agreement with its orientation.

The teachers also expressed satisfaction as to the relevancy of the content, which, it seems was in conformity with everyone's expectations.

Students specified that they had learned new things in the course of their school year. One out of every two admitted that the program had been difficult but that they had mastered it. The same proportion of students stated that they had enjoyed the course.

The Impact of the Program

The main impact of the program seems to have been on the social level. Ninety-one percent of the teaching personnel felt that with the new program, students acquired new knowledge. They also thought that the development of skills would prove useful to the students in understanding the interaction between cause and effect. The program has given students certain values in stimulating their curiosity, encouraging them to examine ecological problems, thus preparing them to take a stand on ecological issues, in the future. This opinion was unanimously shared by the pedagogical counselors, the school principals and the directors of instructional services, alike.

Of the parents consulted three out of five felt that their children had developed a social conscience with regard to their immediate environment. They are now very much aware of water and air pollution and see the necessity to protect their natural resources.

Out of the students consulted, seven out of ten stated that their attitude toward life had been modified in their everyday behavior. The same number seemed satisfied with the knowledge they acquired about plants and animals which they now looked upon with new respect.

Furthermore, one out of two appreciated the information imparted to them concerning water, air and soil pollution. However, only 31% were satisfied with the information imparted to them about their immediate environment and the need to preserve our natural resources.

Another tangible impact made by this program, can be detected with regard to the scientific formation of the students. All those questioned in the survey unanimously expressed their enthusiasm about the moral standards set before the students during the most influential period of their formative years. Parents noted that a new sense of curiosity and responsibility had been awakened in their children. They also noted that when observing various phenomena in the world around them, their children were filled with a sense of wonder and respect. Even more remarkable is the fact that eight out of ten students corroborate the findings of their parents about their new enriched personality.

JUNIOR NATURALIST PROGRAM EMPHASIZING SOIL SCIENCE AND LEARNING INCENTIVES

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The staff at Potomac Overlook Regional Park Nature Center in Arlington, Virginia, conducts summer day camps (Jr. Naturalist) for children entering 2nd to 4th and 5th to 7th grades. In the past 2 years, we have explored various learning incentives to maximize the educational value of the camps while still making them fun for children. In 1987, we added a feature which we hoped would increase the children's attentiveness, participation, and retention of material: a program presented by the children at the conclusion of camp to their family and friends. This paper outlines the theme of our 1987 Jr. Naturalist camp and how the children's presentation was organized and carried out.

Background

In our 1985 Jr. Naturalist camp, we covered a different topic each day; each being a unit in and of itself. This method took into account short attention spans and was relatively easy to prepare, but it was somewhat disjointed and limited in its educational impact. In 1986, we arranged each day's topic and activities around a central theme: the Potomac River. Most of the children lived on or near the Potomac and thus could identify at least to some degree with the theme. Daily review sessions helped reinforce connections between each day's activities. Based on these sessions, it was evident that the children were learning and retaining more information than in the previous year.

Theme of the 1987 Camp

In planning for the 1987 Jr. Naturalist camp, we once again chose to use a central theme. We decided on soil science as our theme for several reasons: 1) we wanted to "get back to the basics" because we felt that soil, water and air were being taken for granted in the Washington, D.C. area; 2) many excellent activities were available to teach soil science; and 3) we saw a great potential to use soil science to illustrate basic ecological principles of local significance (for instance, the relationship between land-use and health of the Chesapeake Bay). The disadvantage of using soils as our theme was that it seemed to have a relatively low immediate appeal to children. It was for this reason that we decided on the use of a presentation by the children themselves. We felt it would be an incentive for the children to learn and enjoy the activities.

Refer to Table 1 for a listing of topics and activities covered in the 1987 Jr. Naturalist camp. As the table indicates, almost the entire camp consisted of activities as opposed to "traditional teaching." Table 2 lists some of the sources for the activities we used. At the beginning and end of each day, we held a review session which doubled as a practice session for the children's presentation.

The Children's Presentation

One of our first concerns in planning for the children's presentation was how to guarantee for the children a turnout worthy of the hard work they would put into the program. The most convenient time for the presentation would have been at the last session of camp, but this would have precluded attendance by working parents and friends. Instead, we opted for additional sessions: Friday evening for 2nd to 4th graders and Saturday morning for 5th to 7th graders. As these times were prone to conflict with other family activities, we made a point of announcing them with the initial publicity for the camp, emphasizing the need for attendance in a letter, and reiterating this concern to parents at the first day of camp. As an added incentive, we arranged a "graduation ceremony" complete with certificates and information packets.

The topics and activities of the camp itself served as the basis for the children's presentation. Children (in groups of two or three) were assigned the responsibility of being able to explain and, in many cases, carry out each day's activities. Some flexibility was allowed in assignments to account for children's individual interests. As mentioned earlier, daily review sessions gave the children the opportunity to "practice" their presentations. A "dress rehearsal" was held on the last day of camp. At the actual presentation, a naturalist introduced each topic and added a few explanatory comments, but otherwise the children "ran the show."

Conclusions

Conclusions drawn here are based on oral testing, comments by the children and their parents, and on general impressions. No formal, or written testing or evaluation was done, but we would welcome suggestions on how to do this in coming years.

We consider the use of children's presentations in our Jr. Naturalist camps a great success for many reasons. First, the presentations in and of themselves were very effective educational programs. The children were so enthusiastic in their delivery that family and friends were thoroughly entertained. Many parents commented afterwards that they not only enjoyed the program, but also learned a lot. The program culminated in a presentation of certificates and seemed to leave everyone with a sense of accomplishment.

The prospect of giving a program to their parents did indeed motivate the children to learn the material covered in camp. In daily review sessions, we were very surprised by the children's retention and understanding of information. Many parents also made the comment that their children made a point of explaining each night what they had learned in camp.

Finally, the use of the children's program made the entire camp experience more enjoyable for both the campers and naturalists. Children were more self-motivated than in previous years and therefore needed little or no coaxing. There were comparatively few idle moments or discipline problems.

The only difficulty we experienced in implementing the children's presentations was in making sure that all the campers and their parents participated in the final program. This called for persistence, but yielded results. The few other weaknesses in the program were purely logistical and should be eliminated next year. We highly recommend the use of a children's presentation at the end of any nature camp. It can be especially helpful when "less interesting" topics are used. We would be glad to answer any questions about our program and would appreciate suggestions from others who have tried using a similar method.

Table 1. Topics and activities covered in 1987 Jr. Naturalist day-camp at Potomac Overlook Regional Park. Numbers in () represent number of activities used to illustrate each topic. Examples of activities follow topics.

THEME: SOILS

Day 1 - Introduction

A. Introductory Slide Show, prepared by National Wildlife Federation.

B. Soil Formation (4), effect of heating and cooling on rocks.

C. Soil Texture (2), telling soil texture by feel.

D. Soil Horizons (2), dig a soil profile and record data such as color, texture, temperature and pH of layers.

Day 2 - Soil and Animals

A. Macro-organisms (2), screen soil samples to find organisms.

B. Micro-organisms (2), make soil bacterial cultures on agar.

C. Hike to look for animal homes in soil and other animal sign.

D. Construction of ant farms.

Day 3 - Soil and Plants

A. Soil and Water (2), test water holding capacity of different soils.

B. Plant Nutrients (3), Color poster of C. HOPKINS Cafe Mg. (This is the acronym for the major plant nutrients and the poster shows a cafe manager standing outside his establishment).

C. Hike to identify some common plants and to examine a rotting log.

Day 4 - Soils and People

A. Soil Erosion (2), effects of contouring and vegetative cover.

B. Soil Compaction (1), water uptake rates of soils compacted to different degrees.

C. Discussion on how people use, harm and help soil.

D. Tree Planting.

Table 2. Primary sources for solid-science activities used in 1987 Jr. Naturalist day camp at Potomac Overlook Regional Park.

National Wildlife Federation 1984. Nature Scope: incredible insects. National Wildlife Federation, Washington, D.C. 64 pp. (Note: Nature Scope issue on soils is planned.)

U.S.D.A. Forest Service 1980. Investigating your environment: teaching materials for environmental education. U.S. Government printing office, Washington, D.C. FS-349.

U.S.D.A. Soil Conservation Service 1986. Teaching soil and water conservation: a classroom and field guide. U.S. Government Printing Office, Washington, D.C. Program Aid Number 341. 30 pp.

Also: college soils lab materials.

ENVIRONMENTAL EDUCATION SERVICES IN ALBERTA PROVINCIAL PARKS

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The Alberta Recreation and Parks Department recognizes environmental education to be an effective way of communicating information on, and encouraging a sense of responsibility for Alberta's environment. In contributing to the development of an environmental ethic, the department supports the Belgrade Charter and believes that environmental education should consider the environment in its totality: natural and man-made, political, economic, technological, social, legislative, cultural and aesthetic. Our department supports the concept that environmental education experiences or opportunities should therefore be a life-long interdisciplinary process, both in and out of school.

The parklands administered by Alberta Recreation and Parks provide excellent study areas for environmental education. In providing access to and facilitating study of these outdoor classrooms, the department feels that it is in a unique position to contribute to the building of a broad view of environmental education. The department works closely with other agencies of the government that deal with the environment, ensuring that we look at the environment in its totality.

Alberta Recreation and Parks provides resource materials to teachers and other group leaders to help them conduct high quality field trips and study programs in provincial parks.

Alberta Recreation and Parks directs the bulk of its environmental education programming at leaders of, and students in, grades four to six. Extensive survey results have indicated that the 8-12 year old students in these grades are the more frequent users of provincial parks for educational field trips. Grades four to six participate in both full days and overnight trips, so ample time and opportunity for a wide range of educational activities is available.

Although most of our manuals are directed at the eight to twelve year old range, we know that many junior high teachers, grades 7 to 9, ages 12-15, and teachers of the younger aged students are also using our materials. They have little trouble adapting our activities to fit their own requirements.

These markets were determined by doing an extensive analysis. Products were designed to meet the needs of the clients using our parks. We continue to do periodic trend analysis and adapt or create new material as required.

For example, our latest manual is designed for teachers and leaders of students in grades 5 to 8, ages 9 to 14. Its theme, "Integrated Resource Management," ties into the changing curriculum of these grades.

Learning Resources Manuals

A Learning Resources Manual is a guide to the cultural and natural features of either a specific park or to Alberta's provincial parks in general. Alberta Recreation and Parks has produced manuals for 25 provincial parks. These parks were selected to represent all the different ecological areas found in Alberta.

The intent underlying the series of Learning Resources Manuals is to enable teachers and group leaders to effectively and independently plan education field trips to a Provincial Park. By providing these manuals to group leaders, it frees our own park staff from leading groups, and it allows the leader to choose activities that best fit in with what they want the children to learn. It also extends the number of sites that offer structured environmental educational experiences.

Each Learning Resource Manual is divided into two major sections: background information for the teacher or leader and activities for the children.

The first section of a Learning Resources Manual gives practical information for planning a park visit so that organizational details do not impede learning once the group is on-site.

Rules for safety and group conduct in the park are provided as well as checklists for personal gear, information on booking procedures for park facilities, and driving distances and routes to the area from major urban centres. This section also describes any group camping areas that are available if the leader is interested in making their visit an overnight excursion.

An overview of the human and natural history and the geology of the area comprises the next major section. This section discusses the development of surrounding landforms and ecoregions and describes the characteristic of the area's climate, wildlife, vegetation and other natural resources. Alberta's human history is also discussed. Evolution of cultural resources from native inhabitation, through exploration and trading by the Europeans, to permanent settlement and development of transportation, agriculture and other industries are emphasized. This background information about the park help the group leader to recognize the richness of the park's history and in turn lead his students toward an appreciation of the area and people located near the park.

The background information about the park may also be effectively incorporated into classroom studies in history, geography and science lessons before the field trip. Suggestions about how best to accomplish this are given in the pre-trip activity section. Projects such as the construction of a historical timeline, a study of community resources and planning of the route to the park are suggested to practice skills that will be further developed in the park. Also included in this section are activities that will lead students to an understanding of proper use of the park and park facilities. In this respect, leaders may also want to refamilarize students with safety rules and leadership skills that they will need later at the park. By involving the class in the planning and themes of the trip before departure, teachers may find that their student's will exhibit increased motivation that will result in a more dynamic park visit.

Once in the park, groups can participate in the on-site activities suggested in the Learning Resources Manual. Each activity will take between 30 minutes to two and a half hours. The suggestion sheet for each activity specifies any special equipment that the activity will require.

Some activities are also equipped with individual data sheets so that students may work independently as well as in the group. Examples of suggested on-site activities include: an investigation of people's effect on their environment, measurement and mapping of wind, and a hands-on examination of fossil samples. Observations and problem solving skills, rather than a fact finding approach, are the keys to a successful park field trip.

Post-trip activities are also suggested in each Learning Resources Manual as a follow-up to the park visit. Discussion and activities based upon what the group did and saw in the park should help reinforce concepts that were learned on the field trip. As with the pre-trip activities, these suggestions tie-in with all aspects of the elementary classroom curriculum. Assignments to design a park suited to the needs of their own community and to create a tourist brochure for the park the students visited are examples of some suggested post-trip activities.

The purpose of the Learning Resources Manuals is to help the teachers or group leaders design an effective learning experience that ties in with the program that they developed for their charges.

The resource section and the activities are there to aid them design a "custom" field trip that best meets the needs of their class or group. It is our aim to make it easy and worthwhile to plan a field trip to a near by provincial park.

These manuals are made available to both schools and clubs free or at minimal cost. To keep costs down, we are producing all our manuals on a desktop publishing system. This allows us to make changes, as determined by our trend analysis, easily and inexpensively. It should be noted that as we change or adapt our materials we send out any revisions to the teachers or group leaders who already have copies of the respective manuals.

The environment is a fragile yet usable resource. It is part of our park's mandate not just to protect and preserve these areas but also to educate our citizens about the value of the resources and the opportunities to be experienced in their great outdoor "classrooms." As the students learn and have fun at our parks, they also learn how and why it is important to preserve and respect these environments for the future.

PROJECT LEARNING TREE AND PRE-SERVICE ELEMENTARY TEACHER TRAINING AT UNIVERSITE LAVAL

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ABSTRACT

In 1980, a first agreement was signed between the American Forest Institute and le ministere de l'Energie et des Ressources du Quebec thus enabling the latter to offer workshops and spread the publications of Project Learning Tree in French in the Province of Quebec under the name L'ARBRE-EN-TETE. During the 1984 Fall semester, such a workshop was offered to some 50 students enrolled in a mandatory Elementary Science Education course offered by the Departement de didactique of Universite Laval.

For almost every following semester, a PLT (L'arbre-en-tete) workshop has been offered to students enrolled in that course. The demand for these workshops has increased to a point where Faculty members and teaching assistants from the Departement de didactique have been given the proper training by the Ministere to enable them to offer PLT workshops to their students.

A brief analysis of PLT shows that its content and approach are closely related to the content and methods taught within that Elementary Science Education course. Actually, both PLT and the above mentioned course focus on the investigation method and on the environment. Since these two features are also prevailing in the Elementary Science Program which is also extensively studied within that course, PLT can be seen not only as a complement to it but PLT could very likely become an important part of that course.

L'ARBRE-EN-TETE ET LA FORMATION INITIALE DES MAITRES AU PRIMAIRE

Suite a l'entente survenue en 1980 entre l'American Forest Institute et le ministère de l'Energie et des Ressources du Quebec (M.E.R.Q.), ce dernier a été autorisé a traduire et a adapter le matériel produit par l'organisme Project Learning Tree afin d'organiser des stages de ce programme a l'intention de divers milieux francophones du Quebec

interesses à l'éducation a l'environnement, notamment celui des enseignants du primaire. Ces stages ont pour appellation l'arbre-en-Tête et c'est le M.E.R.Q. qui detient les droits exclusifs sur le matériel et l'organisation de ces derniers.

Nous avons pris connaissance de ce programme lors du trimèstre d'hiver 1984 par l'intermediaire de l'un de nos étudiants qui nous a relate d'une manière fort enthousiaste sa participation a l'un des stages de l'Arbre-en-Tete. Nous nous sommes alors mis en communication avec monsieur Claude Phaneuf de M.E.R.Q. et, des le trimestre d'automne 1984, le stage de l'Arbre-en-Tête fut offert par des animateurs du Ministère a une cinquantaine de nos étudiants inscrits au cours *Didactique du milieu physique*. Etant donne l'immense intérêt manifeste par les étudiants et leur vive satisfaction exprimée a la suite du stage, nous avons decidé de répeter l'experience et, lors de prèsque tous les trimèstres subsequents, des stages ont ete offerts aux étudiants inscrits au cours *Didactique du milieu physique* ainsi qu'a quelques autres étudiants inscrits a des cours apparentes a ce dernier.

Afin de ne pas monopoliser les ressources du Ministère, nous avons demandé que la formation d'animateur de stage soit dispensée a quelques professeurs et charges de cours du Département de didactique. Grace a la bienveillante collaboration de monsieur Claude Phaneuf et de ses collègues, nous avons reçu cette formation et nous avons été habilités a dispenser des stages de l'Abre-en-Tête sous l'autorité du Ministère.

Nous nous devons de souligner la cordialité de l'accueil que nous avons toujours reçu des gens du Ministère, en particulier celle de messieurs Claude Phaneuf et Claude Simard qui ont été, au cours de ces dernières années nos interlocuteurs dans ce domaine. En plus de leur cordialité, ces deux personnes ainsi que leur equipe ont fait preuve de qualités de pédagogues nettement hors du commun, ce qui, dans le contexte de la formation des maîtres, a su ajouter une valeur indiscutable aux stages de l'Arbre-en-Tête.

Depuis trois ans, ces stages ont été offerts a quelque 250 étudiants et nous ne parvenons pas a repondre à la demande. Une telle popularité auprès de notre clientèle s'explique d'abord par l'approche utilisée qui permet, non seulement de susciter l'intérèt des participants comme le font la *table-mystère* au tout debut du stage ou le jeu *Tic-Tac-Toe* qui se déroule vers la fin de celui-ci, mais qui permet aussi de le maintenir a un très haut niveau, grace a la varieté des activités offertes et a l'implication qu'elle provoque chez les stagiaires soit au moment des sorties ou a celui de la préparation et de la présentation de l'une des activités aux autres membres du groupe. Il va sans dire que le guide d'activités offert aux stagiaires contribue, lui aussi, a la popularité du stage mais il ne constitue pas, loin de la, le seul attrait de ce dernier.

A cette popularité incontestable de l'Arbre-en-Tête, vient s'ajouter sa valeur pédagogique indiscutable. Cette valeur provient d'abord de la qualité des activités proposées. Ces dernières sont simples, adaptables a differents niveaux scolaires; elles n'exigent pas un matériel sophistique et elles habilitent l'enseignant a utiliser les ressources de son milieu immédiat pour atteindre les objectifs proposés. En plus de la qualité des activités, l'Arbre-en-Tête permet aux futurs utilisateurs de se familiariser avec le guide d'activités en faisant de ce dernier l'outil de base de chacun des stages. Cette insistance sur l'utilisation du guide au moment de la formation est l'un des points forts de l'Arbre-en-Tête car il repond a un besoin fondamental qu'ont les enseignants de bien connaître les outils qu'ils devront utiliser, plus particulièrement en sciences de la nature, discipline dans laquelle ils ne possèdent pas toujours la formation qu'ils souhaiteraient.

En plus d'offrir a nos étudiants de même qu'aux maîtres en exercice l'opportunité de prendre connaissance de quelque 90 activités s'adressant aux enfants du primaire et d'en appliquer immediatement quelques-unes, l'Arbre-en-Tête permet d'exploiter les deux principaux volets du cours *Didactique du milieu physique*, a savoir, la demarche scientifique et le contenu du *Programme d'études--Primaire--Sciences de la nature*.

En effet, la plupart des activités, sinon toutes, permettent d'utiliser une demarche de résolution de problèmes que l'on peut qualifier d'experimentale ou, d'une manière plus rigoureuse, elles permettent d'utiliser une demarche scientifique. Cette demarche, que nous considerons comme essentielle a l'apprentissage des sciences de la nature au primaire quoiqu'elle ne soit pas exclusive a cette discipline peut être résumée comme suit (M.E.Q., 1980):

--L'enfant se pose une question, definit un problème.

--Il anticipe une ou plusieurs solutions au problème pose.

--Pour vérifier la valeur de ses anticipations il recherche des elements...

--Enfin, il tire une ou plusieurs conclusions...(p.5)

Or, les activités de l'Arbre-en-Tête, en permettant aux élèves de se poser une ou des questions, en leur proposant d'y repondre et en les invitant à vérifier de différentes manières la justesse de ces réponses qui sont, en fait, des hypothèses ou des anticipations, leur font vivre a maintes reprises cette demarche.

En plus de la demarche scientifique --appelée demarche experimentale dans le programme--,ce même programme propose le développement, chez les enfants, d'attitudes et d'habiletes telles la curiosité, l'objectivité, la creativité, l'ouverture aux autres; l'observation, la classification, la mesure, la prediction, l'inférence, etc. qui sont, à toutes fins pratiques, les mêmes que celles proposées par l'Arbre-en-Tête (1977) qui propose de développer chez l'enfant des attitudes telles "1--la curiosité, 2--l'objectivité, 3--l'esprit critique, 4--la créativité, 5--confiance en soi, 6--l'ouverture aux autres" (p. XII) ainsi que les habilètes suivantes: "1. L'observation, 2. la classification, 3. la mesure, 4. la prediction (l'inférence), 5. la communication et d'autres habiletes simples comme la notion d'espace et de temps et de plus complexes comme la définition operationnelle, le contrôle des variables et la création de modèles." (p. XII)

Enfin, le contenu notionnel du programme qui traite du monde végétal, du monde animal, de l'eau, de l'air, du sol et des objets fabriqués se retrouve lui aussi a l'interieur des activités de l'Arbre-en-Tête. Même si elles ne couvrent pas complètement le programme officiel, ces activités permettent d'en enseigner une bonne partie et cela en respectant l'esprit de ce dernier, ce qui s'avere essentiel autant pour les enseignants en exercice que pour ceux qui sont en formation.

Pour conclure, il nous apparait évident que si l'on ajoute aux deux volets précédemment décrits de l'Arbre-en-Tête la demarche pédagogique qu'il préconise et qui repose sur l'implication de l'élève aux niveaux cognitif, affectif et psychomoteur, ce stage s'avère non seulement un complement enrichissant a un cours de didactique des sciences de la nature mais pourrait y être integré, permettant ainsi une application de la didactique qu'on y préconise. Cette possibilité est presentement envisagée et elle pourrait se concrètiser prochainement en ce qui concerne le cours _Didactique des sciences de la nature_ a l'Université Laval.

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THE PROBLEM OF ENVIRONMENTAL EDUCATION AND AGRICULTURE

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Introduction

Environmental educators have made many advances over the past twenty years in their abilities to teach effectively about natural ecosystems, energy, outdoor recreation, values and attitudes, conservation, and other subjects. Unfortunately, an important gap remains: agriculture. A few of the recent publications from NAEE suggest that little attention has been given to agriculture and food production. Similarly, an examination of college-level texts in ecology and environmental studies turns up only a few treatments, most quite brief.

The importance of agriculture for the environment stems from three points. First, the quality and quantity of the human food supply is almost at the top of the prerequisites for a quality environment. Human life and the opportunity for environmental quality both end if food is missing. Put bluntly, we must do agriculture, and do it correctly, if human life as we know it is to continue.

Second, agriculture is the biosphere's most massive disruption. Over 5 billion people subsist on the produce of about 4.6 billion hectares. Agriculture has obliterated native species, allowed the surface to erode, diverted water for irrigation, and released poisonous chemicals to the environment.

Finally, a wide-spread popular image of rural areas is one of "natural" beauty where a more perfect environmental life may be lived, compared to polluted, urban areas. Rural areas may be pleasing, but farming areas are not pristine places in which "Nature," not man, rules.

Curriculum Development Needs

Environmental educators need to develop materials that can explore four conceptual areas.

Transformation of Nature. Agriculture transforms natural ecosystems. Historically, people have deforested much of the world to create agroecosystems. We also plowed, terraced, irrigated, and drained, all with disastrous consequences for the other species originally there. Understanding the alteration, however, is not sufficient for understanding the importance of the transformation. Human self-identity centers partly on the place of living; urban or rural, city or village. Urbanized populations, can exist only because agricultural technology produces enough to feed them. Ultimately, the maximum population sustainable is a function of agricultural technology. We have remade the earth, and our self-identities and numbers depend upon that transformation.

Productivity. Agricultural production is a function of the investments used: land, seeds, chemicals, machines, fuel, water, knowledge, and labor. The level of production is measured in different ways.

Agricultural production can be described as labor intensive or capital intensive. In the former, more person-hours of labor are necessary for a given level of production than in the latter. Capital-intensive production places high reliance on machines, chemicals, and fuels. Capital-intensive systems yield high production with little human labor.

Agricultural production can also be seen as emphasizing production per hectare or production per person-hour of labor. Efficiency in production per hectare is most likely to be found where land is scarce, e.g., Japan, and high production per hour of labor is found where labor is expensive compared to land, e.g., the USA and Canada. Understanding productivity as a function of technology is essential, because of common assumptions made about these technologies in developed countries. For example, most North Americans view capital-intensive technologies with high productivity per hour of labor as more "advanced" than labor-intensive practices. If high yields per hectare are obtained, that is "good," provided production per hour of labor is also high. These assumptions may produce deleterious policies towards less developed countries.

Trade-offs. Environmental consequences attend every technological choice in agriculture. High land productivities cause pollution from fertilizers and pesticides. On the other hand, high productivity on agricultural land may permit diversion of land to other purposes, such as forestry, recreation, or wildlife conservation. Similarly, capital-intensive, highly labor-productive technology may cause serious social inequities by driving traditional farmers out of business. Such people would probably consider the new technology environmentally unacceptable. On the other hand, people freed from the necessity to do agricultural work may be able to enter other employment that would improve the general environment.

Stability. Agriculture is inherently unstable from year to year and from decade to decade. Climatic variability, particularly rainfall, produces devastating shifts in yields. Similarly, pest organisms can evolve resistance to defenses against them and reduce yields. Finally, human inventiveness produces technical changes that change the nature of agricultural markets. Some farmers benefit while others are harmed. Perceptions of environmental quality are strongly affected by these instabilities from physical, social, and biological factors.

Environmental Education and Social Processes

Students in agricultural colleges do not receive an environmental perspective as outlined above. Graduates of these colleges, however, proceed to occupy important positions in the farming industry, government, food industry, and international development. Resolution of many environmental disputes over agricultural practices would be facilitated by expansion of the intellectual horizons of the agricultural colleges. Similarly, enhanced understanding of agriculture by environmentalists would help make for more productive dialogue. Environmental educators should recognize their participation in a broad social process when they work on agricultural subjects. They should aim their curriculum development and programs toward a broad audience, including agricultural industry and education.

Environmental educators must also understand that the technological dynamism of agriculture will continue to alter the nature of human-agriculture-environment interactions. Environmental education about agriculture must, therefore, remain current with the changes in agricultural production technology. Only by a continual reappraisal of agricultural technology and its impacts on the environment, can environmental educators fulfill their obligations to interpret the nature of Earth's most profound environmental activity.

GRADUATE LEVEL PREPARATION OF ENVIRONMENTAL PRACTITIONERS--WHAT WE HAVE LEARNED SINCE 1972

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Introduction

The first Annual Conference of the NAEE at Hot Springs, Arkansas included a presentation by the present author describing a new graduate program designed to prepare practitioners for the real world of environmental problem-solving. Several quite innovative features were incorporated: substantially greater interdisciplinarity than had been commonplace, a fundamental dependence on experiential learning, and a major share of experience gained outside the university community.

We have learned a lot in the intervening period of fifteen years: much has been positive. Program graduates have moved ahead rapidly to unquestioned success as environmental professionals. However, difficulties have been experienced as well. Perhaps the most important is full recognition of the challenge facing the research university in acting as the foster parent for a truly innovative, interdisciplinary, and application-oriented learning approach. There is a powerful tendency to revert to a traditionally narrow and conveniently managed research focus. As we shall see, specific criteria must be satisfied to retain the desired orientation and goals. To achieve these is not an easy matter.

Why is Preparation of Practitioners an Important Environmental Education Goal?

Much in our present system of higher education has served us well. Thus it is reasonable to ask just what is unique and different about the preparation of environmental practitioners. Current proposals for problem-solving research suggest an answer. An announcement for Superfund Hazardous Substances Basic Research (NIEHS), for example, seeks better tools addressing:

--Improved techniques...modeling movement...so as to increase the reliability of risk assessment...

--How contaminant form (in solution, adsorbed, or in colloidal dispersion, associated with humic or other macrocmolecules) affects toxicity and accumulation potential...

--The impact of toxics and leachates on ecosystems...stages and processes by which ecosystems fail and recover...

When one thinks through the combination of activities required to convert such a program to protective action even this exerpted characterization illustrates several essential facts. Environmental problem solving requires more than an environmental science-related discipline coupled with a strong desire to preserve our world. There is a need to bring together and focus knowledge from a range of disciplines; based in science, but also from policy and the "how to" side of engineering. Historically no traditional discipline has been broad enough and properly focused to anticipate and understand the interactions involved. Perhaps the closest are ecology, based in the biological sciences, and engineering systems, based in engineering science. Experts in individual disciplines are everywhere. Their knowledge can be called upon. But to solve a problem rather than just do more research requires competent execution, selecting from and integrating needed parts of science, technology and policy. This, in our view, required something new--an interdisciplinary environmental professional. The UCLA effort was designed to produce just such a generalist, highly qualified environmental professional.

A Truly Original Approach by UCLA

The 1960s saw rapid growth for UCLA, building from a young but strong base both in the sciences and the professions. Among unique and valuable characteristics inherited from an earlier period were an engineering program which, while strong in science, also stressed breadth and meeting societal needs. It was very strong in resources and the environment. In 1969 the Regents supported a year-long, multi-campus effort--Project "Clean Air"--which sought to join and focus all the state-wide University's resources to resolve the air quality problem. This experience, more than any other, showed us the need for a new approach if we were to actually work toward the solution of environmental problems, not just traditional basic research. There was indeed need for disciplinary strength, but also a need to understand the broader framework within which decisions are made. And there was need for a clinical kind of preparation as well--exposure to the real world of problem-solving--historically not a campus experience.

This led to the design of the curriculum for the UCLA Doctor of Environmental Science and Engineering (D.Env.)--a simple structure (described here as in effect for students entering from its start in 1970 through 1983).

Entry with a Master's degree in a science, engineering, or public health (preferably with a strong, independent research-based thesis).

A program of courses which, in addition to needed strengthening and filling critical gaps, provides a healthy base of knowledge across:

The Environment:
--environmental chemistry, ecology, earth science, atmospheric science, microbiology, etc.

Environment and Technology:
--air and water pollution control, hazardous waste, risk assessment, environmental health, etc.

Environment and Society:
--environmental law and policy, resource economics, planning and management, etc.

--"Problems Courses": team studies; ideally several small working groups, guided by teams of faculty, with planned interaction and addressing a real problem; within time and budget limits, subject to expert critical review, publishable; done for an actual client.

--Internships: several-year external problem-solving experiences; an opportunity to demonstrate creative use of the knowledge acquired, and serving as the foundation for a doctoral dissertation or equivalent.

--A return period following the internship during which the student may demonstrate increased understanding, maturity and the ability to lead, and providing a debriefing exposure for on-campus faculty.

--Necessary examinations.

Thus the program was deliberately designed to inculcate a holistic view of the environment while responding to needs of society. A hope was to take advantage of the strengths, breadth and depth of knowledge within a major university. Program design stressed application rather than basic "research", and thus was directed toward preparation of professionals.

What has the UCLA Program Accomplished?

Well over 100 doctoral graduates have completed requirements for the UCLA D.Env. Their accomplishments and recognition for quality reflect very favorably on the educational design, program execution, and quality of entrants. The program in this sense has met its goals. Of equal importance, education of students in several supporting programs on the campus--engineering, environmental planning, geography/ecosystems, health--has been favorably influenced.

Are There Problems Now or on the Horizon?

By this author's standards there are indeed problems in the present functioning of the designated program for preparation of environmental professionals at UCLA. Many were foreseen at the conceptual state (early 1970s) and considered a risk worth taking. Key concerns are outlined below.

Administrative Structure and Linkages. The initial structure was an anomaly within the University of California system: an Interdepartmental Program under a Committee, reporting via a Dean for Physical Sciences but in practice free-floating across a very large campus, and held together by strong leadership and continuing participation of faculty choosing to be drawn in from conventional programs. Academic Senate review insisted this be "regularized." The end result placed the Program under the School of Public Health (not a first choice). It seems that a narrowing interests has followed.

Faculty Participation--Initially few dedicated faculty positions were authorized and most were not tenure track. They have not increased. Half the Interdepartmental Program faculty participated without formal compensation during early stages. As might be expected, home departments frequently took exception to diversion of resources so that serious cooperative effort became difficult. Active participation in the designated program has narrowed to a small, funded "core." Faculty without a mandated interest are seeking to do the same teaching and professional work as always, but find it more congenial within their home environments, though perhaps with a loss of interdisciplinarity and campus cohesion.

"Problems Courses". With narrowing participation, and driven by the fact of basic research as an almost sole criterion for academic advancement, has come a subtle shift of focus on the teaching side. There is more of a research emphasis, guided by personal interests (and related funding support) of a few individuals. There is talk of need in the once professionally oriented program for more "scholarly" work. But with this attitude, rather than a saturation exposure to problem-solving, work may shift in kind to just another research seminar.

Internship. There is a trend toward a shortened internship from what experience says is best, and the return period requirement has been removed.

Is There a Future for Preparation of Environmental Professionals at UCLA?

Individuals on the UCLA campus within several departments teach environmental problem-solving; with good across-campus relationships, often stretching rules to fit student needs. In a sense this is the "old" way of UCLA interdisciplinary professional preparation; once again quite effective. These natural relationships, though difficult to maintain, will continue to provide a healthy experience. In this author's judgement, the natural approach may prove better in some ways than the "regularized" D.Env. program.

Experience suggests there is a place for a professional environmental doctorate, but its "home" is inherently different than that of disciplinary programs and must be created with care. It is unlikely to be suited to every institution. Research (and Ph.D.) programs belong in the long-established disciplinary departments. Problem-solving on campus, which appears to merit a serious educational effort, needs a blending of the atmosphere of an active environmental consulting firm with wide ranging interdisciplinary teaching.

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"DEEP ECOLOGY AND THE VIEWS OF MARY HUNTER AUSTIN"

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Introduction

The achievement of excellence in environmental education programs requires, I believe, an awareness and an appreciation of the antecedents of contemporary anthropocentric (human-centered) ideas about the environments in which we live. Revisions in the history of American intellectual thought now include information about a number of feminists who have made important contributions to a renewed understanding of the unique relationships between humans and the rest of the universe. This presentation examines some of the views of Mary Hunter Austin (1868-1934) that support positions taken by contemporary advocates of "deep ecology."

Deep Ecology Defined

Deep ecology as a term originated in the early 1970s at the suggestion of the Norwegian philosopher, Arne Naess. He challenged people to probe the relationships between man and nature and attempt to replace contemporary anthropocentric views of the universe with ones that emphasize humans as simply another category of passengers on Spaceship Earth.

Naess supported a deeper, more spiritual approach to the natural world, believing that if people were more sensitive and open to themselves and to the nonhuman life around them, they would be able to cultivate the ecological consciousness necessary to sustain the future. He called for a renewed emphasis on intuition and Socratic methods of questioning the cultural, philosophical, economic, and scientific truths that are generally accepted in western technological societies. Self-realization and biocentric equality were the two ultimate norms or intuitions he considered most basic to deep ecology. (Devall, P. 65).

Advocates of deep ecology point out that the piece-meal, crisis-oriented solutions often proposed to resolve environmental problems failed to address their basic causes. Central to long-range, sustainable solutions to many of these problems is a radical change in human consciousness. Environmental education programs, they argue, must deal with questions of human values and ethics, of culture and character. Environmental educators need to support the development of an holistic, ecological consciousness that supports "living as if Nature mattered."

World View of Mary Hunter Austin

In her autobiography, Earth Horizon (1932), Mary acknowledged that early in her life "it was clear that I would write imaginatively, not only of people, but of the scene, the totality which is called Nature, and that I would give myself intransigently to the quality of experience called Folk, and to the frame of behavior known as Mystical." Her world view stressed the importance of intuitive understanding of the natural world and the importance of "Earth wisdom."

Born in the mid-west, in Carlinville, Illinois, Mary's early childhood encounters with the natural world were powerful and memorable. Of her earliest recollections, before the age of two and a half years, the only thing she found worth noting about them in later life was that they all occurred out-of-doors. (Austin, Earth Horizon, p. vii) Her young world view combined imaginings and dreams with the realities the adults in her world acknowledged as truth. This collection of fantasies and facts provided her with rich resources for her writings. The most profound of her early childhood experiences and the one she refers to most often in her later years gave her a deep, satisfying awareness of her unity with powers beyond herself.

> I must have been between five and six when this experience happened to me. It was a summer morning and the child that I was had walked down through the orchard alone and come out on the brow of a sloping hill where there was grass and a wind blowing and one tall tree reaching into infinite immensities of blueness. Quite suddenly, after a moment of quietness there, earth and sky and tree and wind-blown grass and the child in the midst of them came alive together with a pulsing light of consciousness. There was a wild fox glove at the child's feet and a bee dozing about it, and to this day I can recall the swift, inclusive awareness of each for the whole--I in them and they in me, and all

> of us enclosed in a warm lucent bubble of livingness. I remember the child looking everywhere for the source of this happy wonder, and at last she questioned--'God?'--because it was the only awesome word she knew. Deep inside, like the murmurous swinging of a bell, she heard the answer, 'God, God,...'
>
> How long this ineffable moment lasted I never knew. It broke like a bubble at the sudden singing of a bird, and the wind blew and the world was the same again--only never quite the same. (Austin, Earth Horizon, p. 371)

Her experience of "God Under the Walnut Tree" was her first mystical experience but not her last. Many years later, after her graduation from Blackburn College and her acquaintance with the solitude of the southwestern deserts, she relates an experience which sets the stage for most of her writing about nature.

> It was a dry April, but not entirely barren; mirages multiplied on every hand, white borage came out and blue nemophila; where the runoff of the infrequent rains collected in hollows, blue lupine sprang up as though pieces of the sky had fallen. On a morning Mary was walking down one of these, leading her horse, and suddenly she was aware of poppies coming up singly through the tawny, crystal-sanded soil, thin, piercing orange-colored flames. And then the warm pervasive sweetness of ultimate reality, the reality first encountered so long ago under the walnut tree. Never to go away again; never to be completely out of call.... Only the Christian saints have made the right words for it, and to them it came after long discipline of renunciation. But to Mary it just happened. Ultimate, immaterial reality. You walk into it the way one does into those wisps of warm scented air in hollows after the sun goes down; there you stand motionless, acquiescing, I do not know how long. It has nothing to do with time nor circumstance; no, nor morals nor behaviors. It is the only true and absolute. (Starr, p. 34)

Her versions of truth remained largely private and internal rather than public, external or verifiable through science and reason. Her adult world view acknowledged the need for self-realization and communion with the natural world. Biocentric equality, the second major norm of Arne Naess, would have fit into her world view with few problems. In spite of a large ego, occasional eccentric behavior and self-righteous advocacy of feminist, Indian and Spanish causes, she was capable of immersing herself in the natural world for long periods of time. The desert remained her favorite place to encounter Nature. A visitor, Elia W. Peattia in 1902, described Mary has "one who knows solitude and understands it.... Mrs. Austin has an Indian-like solemnity about her. She has a pervading shyness and likes the philosophy of the Indians and their poetry.... The desert has cloistered her." (Overton, P. 172)

Folk experiences as well as deserts played a major role in the development of her world view. She defined folk experiences as patterns of life when it is lived in a close relationship with the environment. During the years she lived in the southwest, she actively pursued studies of Amerindian folklore, especially songs, rituals, legends and poetry. In periodic lecture tours and in here book, The American Rhythm: Studies and Reexpressions of Amerindian Songs, she explores the experiential nature of rhythmic forms in the environment--such as the role of thunder or the run of wind in the tall grass. (Austin, The American Rhythm, p. 3) She advocates experiences in nature as a way of opening up the consciousness of the urban dweller to the simple joys of life.

Mary's simple lifestyle during her "desert years" provided her with opportunities not only to experience the natural world deeply, but to probe her own spiritual beliefs. As a young adult she discovered that her spiritual strength came from the natural world much more than from the social world. She used her out-of-doors experiences for self-renewal. In a 1902 autobiographical letter she states, "her life was out-of-doors, nights under the pines, long days' watching by water holes to see the wild things drink, breaking trail up new slopes, heat, cloud bursts, snow beast and mountain bloom, all equally delightful because understood." (Overton, p. 166) Her appreciation of the ecology of the desert prompted her to write one of her most successful books, A Land of Little Rain. It took only two months to write it but twelve years of "peeking and prying" before she began it. Her feeling of sisterhood with creatures in the nonhuman world increased, especially with the coyote. After finishing A Land of Little Rain, a major goal was to write "a book about my brother coyote which will make you 'sit up'. I mean this is the way I feel about it." (Overton, p. 166) Her goal, especially for the children in her audiences, was to acquaint them with the creatures in her beloved desert world in new and exciting ways.

Another similarity Mary's writings share with some of the deep ecologists is in her investigation of the spiritual values and ethical systems of other cultures. In Experiences Facing Death (1931), for example, she explores major world religions as well as regional, primitive ones. From the Paiute's she learned of The Friend-of-the-Soul-of-Man, locally known as "Wakonda." It accounted for many inexplicable phenomena of things "a rock glittering in the late night, a bird singing, a buffalo affecting the hunter with the sense of mysterious awe...a man making a song, or following a hunch." (Austin, Experiences Facing Death, p. 132)

Summary

Deep ecology would have suited Mary Austin well, especially during her "desert years." Her spiritual approach to Nature, her quest for openness to herself and the biocentric world and her attempts to deal with basic questions of values and ethics, culture and character, are some of the goals shared with contemporary advocates of deep ecology. Her writings about the southwest provide important roots for understanding and appreciating the importance of retaining wilderness worldwide. She lived "as if Nature mattered."

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THE FRENCH VERSION OF PROJECT LEARNING TREE

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The World Conservation Strategy states that conservation action has a world wide effect and that the responsibility of environmental disasters is also world-wide. Political frontiers between countries do not effect our living world. In that sense, any environmental education program aiming to change attitudes and lifestyles for the conservation of the biosphere is important. To be effective, a conservation program must be implemented regardless of human boundaries.

In 1978, our Service was about to revise all its environmental education programs. Instead of reinventing the wheel, we decided to search for existing programs dealing with the wise use of the forest. We came across Project Learning Tree in British Columbia through the Canadian Forestry Association. A small investigation took us to Washington DC at the American Forest Institute, now known as the American Forest Council.

Project Learning Tree is a supplementary environmental education program for use in and out of the classroom with young people, their leaders and teachers, from kindergarten to secondary levels (K-6 and 7-12). The guides provide more than 175 teaching activities for use with various subjects from social studies to mathematics.

The Project Learning Tree becomes l´Arbre-en-tete

To be implemented in Quebec, Project Learning Tree had to be translated and adapted to our particular situation. An agreement to this effect was signed in early 1980. L´Arbre-en-tete, meaning "tree in our mind", was available in January 1982. Our programs were mainly oriented towards the primary levels, so only the K to 6 activity guide was translated.

Using an existing program, already in use and evaluated, allowed us to go further. We made the following changes.

--The bibliography was revised to identify resources available in Canada.

- --Photography was completely changed to reflect our countryside and landscape.

- --Cultural activities were adapted according to the particularities of our history and the history of our native people.

- --Subjects, objectives and skills were adapted to the Quebec school curriculum.

An agreement between the Department of Education and the Department of Energy and Resources

In 1978 and 1979 the Quebec department of Education revised the primary level nature science program curriculum. Using the experimental approach and having the environment as the major learning subject, the new program was meeting our objectives to give a better understanding of the forest. PLT and l'Arbre-en-tete were the first resources available to teach this new science program in the outdoors. An agreement concluded between our Department of Energy and Resources and the Department of Education concerned a workshop which enabled the teachers to take their classes outdoors, in the natural environment. Being part of the teachers' training to implement the new science program, this agreement gave us a ready market for our workshops. Approximately 33,000 teachers received our workshop offer.

A special workshop

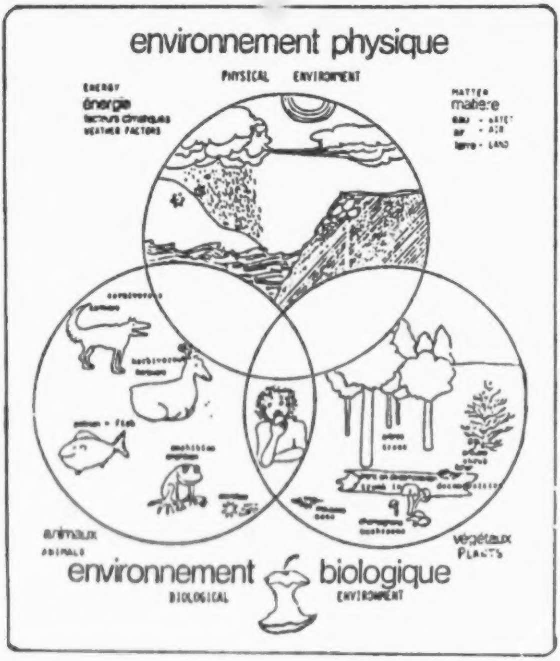
Because of this special agreement, the workshop has two major goals:

- --To introduce the teachers to the natural environment

- --To introduce them to l'Arbre-en-tete (PLT)

To meet these goals, the workshop was planned for two days. On the first day, participants explored the environment and studied the ecosystem around them.

Beginning their study with the different components of the physical and the biological environment, the participants use many PLT activities to better understand the forest ecosystem.


environnement physique
PHYSICAL ENVIRONMENT
ENERGY
énergie
facteurs climatiques
WEATHER FACTORS
MATTER
matière
eau - WATER
air - AIR
terre - LAND
poisson - fish
animaux
ANIMALS
végétaux
PLANTS
environnement biologique
BIOLOGICAL ENVIRONMENT

The second day is dedicated to the study of L'Arbre-en-tete. When the participants are English-speaking, the original Project Learning Tree (American version) is used.

Success to date

Since 1982, almost 10,000 teachers took the workshops. We gave close to 500 workshops in all parts of the Province of Quebec, some as far north as James Bay.

Seasons of the Forest

To be effective, any training session must develop a follow-up. One of the comments we received from the teachers was that it was difficult for them to apply their knowledge acquired during one season's workshop to another season. Since it was impossible to repeat the workshop in another season with the same group, we developed supplementary material to meet this need. We developed a slide presentation and a video tape describing the forest and its activities in each season. It conveys the themes of the school science program curriculum and is completed by an animation guide for each season.

Contents of the Seasons of the Forest

--Four audio visuals based on each season.

--Each program lasts approximately 12 minutes

--Available only in French

--Music rights were brought only for the province of Quebec because of financial constraints. (Negotiations possible for use outside the province).

The scenario is divided into different chapters, each one exploring an aspect of the forest during a particular season. It is designed to be used by the 9 to 12 year olds, but different chapters could be interesting in special ecology classes at the secondary level or introducing a special subject for younger children. The teacher could present the overall program in "one shot" or use an individual chapter in his lessons.

To give you a better idea of this material, here is the outline of the "Fall".

-- Fruits and seeds
-- The color festival
-- Short story of soil
-- In contact with the bedrock
-- In forest country
-- Producing new seedlings
-- Getting ready for winter

For more information contact the author.

COMBINING EDUCATIONAL AND RESOURCE MANAGEMENT GOALS THROUGH A NEW ENVIRONMENTAL EDUCATION PROGRAM

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Purpose

This paper discusses the process used to develop a wildlife education curriculum that could be used by school teachers to support and enhance the New York State (NYS) elementary science requirements. It outlines the major resource management and educational issues involved in the development of wildlife education goals and concepts, the intra- and inter-agency coordination required to integrate management and educational objectives, and the implementation problems and suggested procedures for establishing a viable wildlife education program in the elementary schools.

Background

The NYS Department of Environmental Conservation (DEC), as the state agency responsible for the management of wildlife and natural resources, believes that without public understanding of resource management principles, practices, and purposes, support for agency programs will be minimal. The agency has therefore made a commitment to public education, recognizing that before people can understand the rationale for resource management programs, they must first have a good comprehension of basic ecological principles underlying management.

DEC´s new thrust in wildlife education coincides with the introduction of a new elementary science syllabus in NYS public schools. The new science syllabus, with its strong ecological emphasis, provides an excellent opportunity for discussion of wildlife and resource management concepts, and wildlife in turn can be a primary vehicle to explain fundamental ecological principles. It was felt that the need to implement the new elementary science syllabus in the classroom would motivate teachers to use educational strategies for science education that are both engaging to their students and easy for students and teachers to understand.

The New York State Education Department (SED) expressed interest in DEC's participation in implementing the new science syllabus by requesting DEC to provide instructional materials that could be used by classroom teachers in developing science programs with a focus on ecological concerns. DEC's Bureau of Wildlife consequently decided to approach this as an opportunity to influence wildlife education in a systematic and comprehensive way. Consequently, they contracted with the Human Dimensions Research Unit (HDRU) in the Department of Natural Resources, Cornell University, to assist in the development of a wildlife education program for elementary students in grades 4-6 and to evaluate the program's effectiveness in the NYS public schools.

Program Development

The HDRU facilitated a brainstorming session with representative Bureau of Wildlife biologists, Sportsmen Education coordinators, and Division of Environmental Education staff in DEC to develop a preliminary set of wildlife eduction goals, concepts and objectives appropriate for elementary school children. As a result of the brainstorming session and subsequent review process, four categories of educational goals were established: 1) basic wildlife knowledge; 2) wildlife management concepts; 3) attitudes toward wildlife; and 4) skills to apply information about wildlife. The management agency's goals, concepts, and objectives, referred to as the "Wildlife Education Curriculum," focused on the application of basic ecological principles to wildlife management. It emphasized important wildlife management principles and practices and their use in New York State. Additionally, it stressed the role of wildlife managers as stewards of natural resources.

The HDRU then integrated the DEC wildlife education goals and concepts with the concepts outlined in the curriculum framework from Project WILD, which broadened the scope of the agency's Wildlife Education Curriculum. This Wildlife Education Curriculum was then submitted for review to an Expert Review Panel (ERP) comprised of education and natural resource professionals. The ERP examined the curriculum for its potential to communicate wildlife knowledge, the value of wildlife, and the responsibility of people to be active stewards of wildlife resources. Integral to the ERP's evaluation of the curriculum were considerations for its implementation in New York State elementary classrooms.

The three major issues that emerged from the ERP's deliberations concerned ecological information, wildlife management concepts, and human values of wildlife. Regarding ecological information, the ERP felt that a focus on wildlife should be nested within a concern for all living things, and that a sense of stewardship needed to be integrated with the presentation of ecological information and management principles. Although the ERP saw the legitimacy of discussing wildlife management as a means of resource management, it felt it was inappropriate to relate specific bureaucratic wildlife management policies. In relation to human values of wildlife, the ERP believed the curriculum should convey a sense of obligation to living things. The two value positions should be: 1) think before you act, and 2) become informed. The curriculum should not indicate that wildlife management is the only way to achieve stewardship, but that it is one approach, the consequences of which can be discussed.

Rather than enumerating alternative forms of stewardship, the ERP suggested that the concept of management be broadened from the traditional wildlife management focus to one that views management as any intentional change, including a decision for nonintervention. It was pointed out that the broader concept of management would be beneficial, especially in light of the concern that the curriculum be sufficiently broad-based to be relevant to the concepts an elementary school teacher must communicate in the classroom. The broader definition of management would also expand the ways in which students could experientially learn about management and bring management onto a personal level. With the adoption of this broader definition of management, it was decided that management concepts should be applied to environmental management as well as to wildlife management.

The final Wildlife Education Curriculum submitted by the ERP back to the management agency consists of two parts. The goals and concepts in Part I build upon the ecological principles in the New York State New Elementary Science Syllabus. They emphasize the interdependence of humans with their environment and use interdependence as the rationale to establish stewardship responsibility for wildlife and the environment. The concept of management is introduced as a means of demonstrating stewardship.

Part II of the Wildlife Education Curriculum develops the concept of wildlife and environmental management. It asks students to consider the consequences of management decisions and emphasizes the need for both knowledge and action to exercise stewardship. It also stresses personal responsibility for evaluating and applying information to be able to make rational and defensible management decisions.

The Bureau of Wildlife, sponsor of the Wildlife Education Curriculum for the management agency, reviewed the changes made by the outside panel of education and natural resource professionals and agreed to use the ERP's revised goals and concepts in the implementation of a Wildlife Ecology Support Supplement for the NYS elementary science program.

Program Implementation

Recommendations

There were three major concerns regarding program implementation: 1) the cognitive and moral abilities of 10-11 year olds, 2) teachers' comfort with teaching science, and 3) the time constraints for teaching environmental education. The ERP recommended that the most appropriate teaching strategy for 10-11 year olds is experiential education which will ignite children's interest, affect their values an behavior, and give them first-hand experiences as active stewards of wildlife and the environment. To increase teachers' comfort in a topic area they often feel ill-prepared to teach, it was suggested that support materials be packaged as self-contained modules, organized in order of increasing complexity. Recognizing that elementary school time for teaching environmental education is extremely limited, it was suggested that the material be integrated with the existing school curricula whenever possible.

Interagency Task Force

The management agency's Wildlife Education Curriculum goals and concepts, as amended by the ERP, will now be presented to an interagency task force made up of representatives from the state management agency, state education department, and elementary schools. The task force has the job of evaluating and screening educational materials, establishing procedures for integrating materials into classroom activities, and identifying needs for teacher training. Actual formatting of lesson plans (subsequent to task force guidelines) will be conducted by DEC's Division of Environmental Education. It is anticipated that the task force will complete its activities by May 1988 and that program implementation and evaluation will take place in 1988-89. The evaluation of the Wildlife Ecology Support Supplement will focus both on teacher adoption of materials and program effects on children's environmental understanding.

Conclusions

Originally a product of a resource management agency, the Wildlife Education Curriculum strongly emphasized traditional wildlife management principles and practices and equated wildlife management with stewardship. The management agency recognized, however, that to convey this message through the public school system would require integrating management objectives with education objectives. It was with this blending of resource management and educational goals in mind that the agency submitted their Wildlife Education Curriculum to the outside panel of education and natural resource professionals for review. The final, revised curriculum established by the ERP emphasizes a broader concept of management, speaks of wildlife management as one form of stewardship, and applies management principles to both wildlife and environmental management.

The management agency accepted the changed focus of the Wildlife Education Curriculum, recognizing that their own strong pro-wildlife management stance needed to be put in the larger context of environmental management if it was to be competitive with other educational material. There has been careful consideration of implementation constraints and a real willingness by the agency to adapt to mutual management and educational goals. The current curriculum now embodies the components of the definition of wildlife education proposed by Adams and Thomas (1986:480) as, "those teaching and learning processes that introduce information about specific wildlife resources, habitats, ecological interrelationships, conservation, and management strategies into public school and community education programs." The blending of management and public educational goals should enhance the success of the Wildlife Education Curriculum in the public schools.

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ENVIRONMENTAL CONSIDERATIONS IN THE DEVELOPMENT ARENA: WHAT TWO-THIRDS OF THE WORLD CAN TEACH US ABOUT ENVIRONMENTAL EDUCATION AND TRAINING

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> "What is past one cannot amend, for the future one can always provide."
>
> -Confucius

These are challenging times in international environmental education and the environmental movement. Groups that at best have typically been antagonistic towards any conceptualization of the meaning of environmental degradation and destruction are now engaging in a purposeful dialogue around key issues such as The Tropical Forestry Action Plan (World Resources Institute, 1987). Along with this trend is the increasing recognition by many countries of the critical role environmental education plays in defining national priorities. Within this context, the idea of environmental education takes on a life of its own with many groups providing input. Consequently, the dilemma the environmental community must focus on is "Do we know the full extent of educational opportunities within our own work?" and as Dr. Atchia (1984) suggests "What is appropriate environmental education?"

As environmental educators, how do we articulate our knowledge and skills in this field to the various institutions we can influence? Based upon what assumptions do we advise others? And, how do we involve our audiences? Addressing these questions provides a starting point for us to move beyond simply addressing the causes and consequences of environmental degradation which are becoming well known. More important still, we need to consider the links to a country's economic and social well-being, factors which have begun to re-shape the international arena. Unlike the scientific and technological solutions, figuring in the human component into the formula has presented unpredictable problems that need special considerations (O'Riordan, 1981). Amongst the confusion, the question that emerges is one of "How do we increase our level of environmental awareness and understanding, and once we begin to understand, how do we continue to maintain on-going access to a rich source of intelligence from a variety of perspectives?"

This implies going beyond clarifying environmental concepts and arousing public concern. It necessitates responsive policy structures and broad participation.

Meeting the Challenge

Even a cursory review of major events over the last several months reveals this growing trend towards widespread concern with political commitment to practical responses to stabilize environment and development pressures, both globally and within a country. From a macro level of analysis, the 1987 report by the World Commission on Environment and Development presents a strong case for profound changes in the structure of the relationships within and among institutions such as governments, the public and private sectors, and non-governmental organizations (United Nations, 1987).

Those observers who consider this scenario beyond the realm of possibilities should take note that this is already occurring among the multilateral development banks (MDB). The 1987 Foreign Assistance Act essentially mandates the U.S. Secretary of the Treasury to instruct U.S. Executive Directors to "vigorously promote the commitment of these institutions" to environmental reform. The World Bank has responded with the creation of a "top-level Environment Department" that will help direct the integration of environmental considerations into the Bank's overall lending and policy activities (World Bank, 1987).

As the most influential and powerful MDB in the world, the World Bank presently funnels $15 billion annually to Third World nations to encourage economic development. As an autonomous international organization, The Bank represents 148 member nations. Most of its 6,000 employees are based in Washington, D.C.; many are not environmental specialists and are used to operating within a bureaucratic structure. The common theme throughout the Act is to augment participation as illustrated by "adding professionally trained staff," "ensuring systematic and thorough environmental review of all projects and activities" with an ecological and natural resources component, "creating career and other institutional incentives," and involving MDB staff as "environmental and health ministers, or comparable representatives." The task then is how to build upon and manage environmental considerations within the organizational constraints of the MDB. If successful, the implications will be extensive.

Linkages With Environmental Education and Training

To the cadre of professionals working on the relationships between environment and development, it has become readily apparent that optimizing project success depends not only on an educational component but also a good grasp of the process. This in turn requires the early identification of how environmental education fits into the overall plan of action. Because this signifies coordination and cooperation across sectors and among different audiences, be they decision-makers, professionals, environmental managers, or the general public, the larger issue of facilitation must be addressed by key people from the various institutions (4th World Wilderness Congress, 1987).

Dr. Atchia reminds us, this means "...educating people to recognize features of quality within our own society, and enhancing those elements from wherever appropriate." While he was referring to the need for Africa to bring about stability using many of its own strengths, sources of knowledge, and resources, he poses an essential question that should be given serious thought. First a country must answer for itself: ´What does development mean?´ and then, ´Who decides based upon what assumptions?´ (Atchia. 1982) For many it is all too clear what will happen if the resource base collapses. Yet, environmental degradation continues at an unprecedented rate of deterioration. Thus creating an even more delicate interrelationship between issues of economic productivity, health, population pressures and managing ecosystems. The complexity of the problem leads us back to the issue of what is appropriate environmental education?

The Example of Kenya

By way of illustration, let us examine Kenya´s national youth movement. In 1966, the Wildlife Clubs of Kenya began through the special interests and commitment of a high school teacher and his students. In 1968, the group convinced the Permanent Secretary of the Ministry of Tourism and Wildlife of the importance of the clubs. The first youth seminar was held in 1968 and the program was incorporated into the National Wildlife Education Program under the Ministry. By 1969, 60 clubs existed and a national coordinator was hired. Today, there are over 1,300 clubs. WCK is an indigenous movement that has become internationally renown. Other countries would like to emulate their success but often fail to do so. (Chumo, 1982)

Upon close examination of the program it becomes clear that the clubs primarily are based upon student input and design of the structure and activities. Also, with minimal outside guidance the students essentially run the clubs.

The end result has been tremendous national pride in the WCK and an extensive youth conservation movement. What can be learned from this national effort is an examination of our own approaches to environmental education. Do we design and impose a set structure or do we build a knowledge base and facilitate an on-going process that includes input for the learner?

The Caribbean Environmental Education Program

In 1984, the World Wildlife Fund sponsored the development of an environmental education program in the Caribbean Islands. The purpose of the project was "to address the shortage of conservation educators in the Eastern Caribbean by training local professionals in environmental education and public awareness techniques." Of special interest are the unique aspects of the approach to the project and its outcome. First the participants received funds to implement their own program in their home country. Secondly, technical assistance was made available to ensure the momentum gained during the training phase carried over to the assessment and implementation phases (Medina, 1984).

The participants were first provided with opportunities to gain first hand knowledge of environmental problems that small insular islands face. Building upon this understanding of the complexity of environmental issues, they returned to their home country to collect information on their own problems. This information base was used to determine an appropriate program and accompanying materials as well as a design for a strategy to mount an environmental education campaign. The end result is a reflection of the decision to employ a systematic learner-based approach. Copies of the materials are available through the World Wildlife Fund, U.S.

The evidence from this project's success is based upon the strength of its overall design. Within our own organizations are avenues for initiatives and resourcefulness. Do we provide the necessary funds and technical assistance to ensure project success? At what point do we invite participation to encourage an understanding of environmental issues that can lead to problem-solving and action?

Wood, et. al (1985) sums it up plainly in stating that an approach to environmental education must "start with a basic analysis of the problem and continue with the planning process which will create an EE program uniquely applicable to that situation." Through timely initiatives and the reordering of institutional priorities, opportunities abound for us to further articulate the role of environmental education in meeting the challenge of maximizing environmental benefits and achieving development goals for the present as well as the future.

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ENVIRONMENTAL EDUCATION FITTING IN SECONDARY EDUCATION: A UNIT ON MEAT CONSUMPTION

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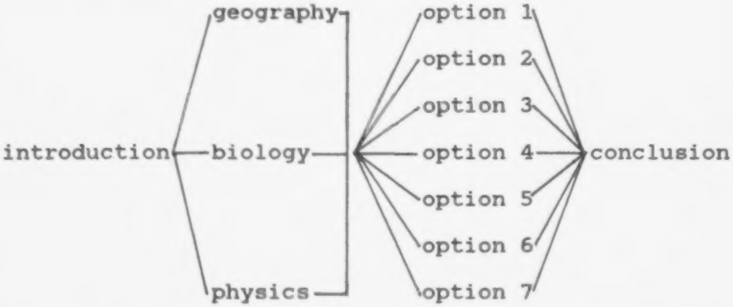
A number of private environmental organizations in The Netherlands, together with several universities, have embarked upon a joint project to stimulate environmental education in senior schools. The project has three main objectives: to develop teaching materials and a curriculum for environmental education; to carry out related research (Jagar, 1987); and to prepare the supervised introduction of the teaching material into schools.

Environmental education is not a separate subject in Dutch education, but is a field of interest which we feel should be discussed in lessons on various subjects. For practical reasons environmental education should be integrated with four existing school subjects: biology, physics, chemistry and geography. Our project decided to let students use the special jargon and skills of these disciplines to get a good grasp on one environmental issue: meat consumption. They would study science and geography in an environmental context (Kortland, 1987).

When we began developing this unit on meat consumption, we considered three possible objectives. The first, namely to make our students stop eating meat, might well lead to a reduction in environmental problems, but taken to society at large would also deal a death blow to our farmers, who form an important occupational group. And we mustn´t forget that meat also contains valuable proteins and vitamins. The second objective, simply to transmit knowledge and insight to students, couldn´t do any harm. However, the unit would not present any immediate implications for students´ behavior with regard to the environment. The third objective we considered was to show students several solutions and behavioral alternatives and to train them to make up their own minds about things. This objective seemed to be the most promising and acceptable one, not only from the point of view of protecting the environment. In education in general, and in science education in particular, there is a growing conviction that students should be trained to be self-confident and to take responsibility so that they are better prepared to play a responsible role in society. They should be taught to weigh the different arguments that stem from their science and geography lessons, before reaching decisions. This conviction has led us to design the unit around the central question: How much meat should I eat, considering the environmental problems connected with meat production and the possible solutions to these problems?

The unit begins with an introduction, followed by separate sections, each fitting into the existing school subjects. These are followed by some optional sections and finally a conclusion which summarizes all the material treated and invites each student to make a decision.

The purpose of the non-specialized INTRODUCTION, which takes about one hour of lesson time, is to create awareness. Before the lessons the students have been asked to fill in a form at home giving details of what they have eaten in the last few days. In this way they gain some insight into their eating habits. They soon realize what an important place meat occupies in their diet. In this introduction the central question is raised, to be worked out later in the separate sections.



The SPECIAL SECTIONS on geography, biology and physics take up to four or five lessons each. Most of the topics in these sections fit into the usual curriculum of the school subjects. The main emphasis here is on gaining knowledge and insight. The working methods emphasize the processing of information and the application of this information via tasks performed by the students. Part of the time is devoted to practical work. We advise teachers to let their students work in groups as much as possible. In this way they learn to work together and exchange views.

The special section on GEOGRAPHY begins with an investigation of the Dutch system of meat production. What is factory farming? In which parts of The Netherlands is it practiced? What factors have contributed to the rapid development of factory farming? Then we take a look at the effects of factory farming on our environment, particularly with regard to the quality of the landscape and the ground water. One ingredient of fodder, tapioca, is singled out for closer study. The cultivation of cassava in Thailand is discussed and the consequences for the Thai environment are examined.

In the BIOLOGY section we analyze the food we eat, with the help of the food list mentioned already in the introduction. A number of questions are asked: What exactly do we eat? What is the significance of food, and particularly meat, for our bodies? Is meat necessary? The meat is examined more closely. What is meat? How does meat arise in nature? How does the Dutch farmer produce meat? What about the well-being of the cattle? Are there alternative methods available? What about the price of meat: is it too high or too low? As in the case of the geography section, the effects of factory farming on the environment are considered. Special attention is given to the excessive use of dung and to acid rain.

The PHYSICS section concentrates on the role of energy in food, and food production. Solar energy is fixed by plants. In the food chain this energy is partly used and partly stored. Cattle-rearing is, in fact, a food chain organized by man. It is argued that a meat diet involves a less efficient use of energy than a vegetarian diet.

The OPTION SECTIONS, which take up two lessons, are intended to let the students apply what they have learned to a new situation and aim to deepen their understanding or knowledge of alternatives and solutions.

The CONCLUSION, for which one lesson is required, is not linked to any special subject--nor was the introduction--but it forms an essential part of the unit. The students now have the central question 'dished up', as it were, on their plates. The questions raised and treated in the specialized and optional sections are brought together. Students weigh the pros and cons of eating meat. In their final task, they plan a meal by working in groups. The meal is prepared and eaten. The composition of the meal should reveal the student´s answer to the central question posed by the unit: How much meat should I eat, considering the problems connected with meat production, and the possible solutions to the problems?

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ENVIRONMENTAL EDUCATION AT A DISTANCE: AN ENQUIRY-BASED COURSE IN TEACHER EDUCATION

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Why Do I Think You Might be Interested in Deakin's EE Course for Teachers?

There are number of features which I believe distinguish Deakin University's environmental education course from similar courses offered at other institutions:

1. This course takes place in a teacher education program that is presented in an "off-campus" (or "distance education") format. Most of the students in this B.Ed. program are practicing elementary and secondary teachers with several years' teaching experience and continuing access to "their own" class of pupils. Some of the implications of this feature are:

--a different pedagogy;

--a different support structure;

--greater opportunities for the engagement of a wide range of environmental issues and real classroom settings.

2. The course is enquiry-based. This enquiry basis is double-edged: students are required to conduct their own independent enquiries into

--current, controversial environmental issues close to home; and

--their own educational context.

3. The emphasis in the course is as much "educational" as it is "environmental"--it is essentially a curriculum studies course. It treats environmental education as an effort at educational reform--a reform effort characterized by a number of challenging teaching and curriculum issues. Consequently, its main interest lies more in identifying and addressing these challenging educational issues than in solving particular environmental problems.

What is the Rationale for the Course?

At least two related issues have shaped the evolution of this course. One is the perceived "solicitous surrender" of environmental education in the face of resource strictures; the other is the question of "teacher professionalism".

The "Solicitous Surrender" of Environmental Education. In Australia, environmental education is not a high-status subject in the school curriculum. Perhaps its political bent renders it unpopular with conservative teachers and school administrations; perhaps its prescribed interdisciplinary character renders it a square peg for the round hole of the conventional discipline-based subject curriculum. Environmental education has continually had to struggle for resources because it is not a high-status subject (it is neither "high-status" nor "subject"--none but its advocates ascribe the former; even its advocates disavow the latter).

In its struggle for resources and for legitimacy, environmental education has become vulnerable to the technocratising influences of conventional sources of support. It is open to co-option by academics, medium-level organizations and materials developers whose professional interests are served by a technocratic interpretation of environmental education--an interpretation which ignores the politicized character of the environmentally-and socially-critical "education for the environment" and stresses the ecologically-oriented and consequently safe and as-you-were "education about the environment" (Robottom, 1987). In order to acquire resource support, there are elements of the environmental education movement that are prepared to redefine environmental education, to abandon its critical political edge. In environmental education there are traces of solicitous surrender.

What is being suggested here is that environmental education is continually being "sold out" at a number of levels. In many cases, we are unaware of the extent to which the rhetoric of our policies is matched by the reality of our practices. And in some cases we consciously--though perhaps unwillingly--contradict our best environmental intentions. Often the pressures of our circumstances and settings and relationships seemingly close in and present us with little choice. Sometimes we willingly engage in a trade-off: redefine our environmental education a little in exchange for relief from the sort of pressures we encounter as environmental educators. We are part of an hegemony, and environmental education may be failing as a consequence.

I think that in order to mount an appropriate response to the issues of improving environmental education, we need to recognize that practitioners have theories or philosophies about teaching and about environmental education, and that these should be respected. We need to recognize that the actions of environmental educators at all levels are shaped in part by these theories or philosophies and in part by outside pressures, some of which are political in nature. So environmental education courses like Deakin's need to encourage practitioners at all levels to speak about their philosophies and their actions (not just the latter, as often happens when consensus about "what environmental education is" is assumed). Importantly, courses in environmental education need to provide opportunities for practitioners to examine the relationship between their philosophies and their actions, and to vigorously critique the circumstances accountable for dissonances between philosophy and action.

Changing Views of Teacher Professionalism. There is a distinctive view of teacher professionalism gaining credence in Australian education. Put simply, this view centres on the idea of "teachers as inquirers into education practices". There are strong moves for a devolution of decision-making away from central agencies and to individual school communities; and there are powerful arguments for a linking of professional theory and practice by creating the conditions for participant research by practitioners. There are moves to provide alternatives to conventional approaches to professional development which seek to impose and maintain a division of labor between outside researchers-as-experts and school-based teachers-as-technicians. One of the debates that needs to be worked through is the nature of an appropriate form of educational enquiry to be associated with this view of teacher professionalism.

What is the Response of the Course to these Perceived Issues?

The Course Materials: The Monograph. The title of the monograph is *Environmental Education: Practice and Possibility*. As the title suggests, the intention of the Monograph is to *describe practices* in the field of environmental education; but the Monograph also adopts a prospective, speculative stance in pointing to *future possibilities* in environmental education. The interest of the monograph is to offer a critique of selected past and current practices, and thereby to prepare the ground for a consideration of alternative images in environmental education capable of shaping future action.

Overall the Monograph adopts a politicized view of environmental education. It sees both environmental issues (where environmental values and actions are in contention) and environmental education issues (where educational values and actions are in contention) as inherently political. Some of the issues discussed in the Monograph are:

--the essentially social and political character of environmental problems;

--the "slogan system" of environmental education: exploitation of the generic, equivocal and ambiguous nature of "Environmental Education";

--competing self-interests in environmental education policy, organization and activities;

--the relationship between conventional patterns of schooling and socially-critical aspirations of environmental education;

--incorporation of environmental education into the existing hegemony of traditional schooling;

--distorted views of "environment" and "environmental problems" associated with patriarchal perspectives in education;

--fundamental incoherences between schooling informed by an "epistemological" paradigm and the "ecological" paradigm of environmental education.

The Monograph develops an argument for a non-technocratic approach to professional development by advocating practitioner research in environmental education and concludes with a number of guidelines for enquiry-based professional development. (Environmental Education: Practice and Possibility is available for general sale from Deakin University Press).

The "Tasks". The Tasks are self-contained units of enquiry designed to support enquiries conducted by practicing teachers into environmental education issues in their own teaching settings. The Tasks relate to issues raised and discussed in the Monograph. Each Task comprises a statement of issue, a rationale for or background to the issue, a sample of the relevant reading for the issue, and a statement of the Task requirements. There are several Tasks to choose from; students select and work through two such Tasks in this course.

What's the Curriculum of the Course?

This course is enquiry-based. Its main interest is not the provision of information about the environment or about environmental education: its main interest is to create the conditions for practicing teachers to engage in enquiries into environmental issues in the context of their community or local environment, and into environmental education issues in the context of their educational setting. These enquiries generate the "substance" or "content" of the course. The course is organized around two assignments.

Assignment 1 ("Investigating a Local, Current Environmental Issue") requires students to locate a proposal for environmental change in their community--a proposal for land use that is contentious, about which the community is divided. This assignment causes students to regard the environmental context of this selected issue as a resource; they need to study the physical site of the issue and to engage the community by interviewing individuals and groups affected by the issue. In most such issues, there will be more or less distinct protagonists, antagonists, and decision-makers. The task for students in this assignment is to gather information and perspectives to enable them to develop an interpretive account of the selected environmental issue. Thus this assignment requires students to develop an interpretation of the relationships between the physical, biological and social aspects of a controversial environmental issue, to demonstrate an understanding of how those relationships affect (or are likely to affect) the resolution of the issue in question, and to indicate exactly what is at stake in the view of the major participants in the dispute.

Assignment 2 entails students to work through one or two of the Tasks described above. These Tasks cause students to engage the educational community of their everyday professional life. In this case, their resource is their classroom and school; the information they gather will be in the form of data about their own teaching, and the perspectives of relevant others such as pupils, fellow teachers and perhaps parents.

Whereas the first assignment invites students to engage the context of an environmental issue, this second assignment requires them to engage the educational context (pupils; teachers; administrators; parents; curriculum materials; institutional structures) of their professional work. Essentially, in this assignment students need to study aspects of their own environmental education teaching and the setting in which that teaching occurs.

As students prepare their reports on these two assignments, they need to be descriptive and reflective, and the Monograph figures centrally in their reflections. Accounts describing environmental and education enquiries are expected to be analytic and reflective in appraising the enquiries and their outcomes with reference to the Monograph, and (in turn) critiquing the claims about environmental education made in the Monograph.

CASE STUDIES IN COLLEGE AND UNIVERSITY ENVIRONMENTAL STUDIES PROGRAMS TODAY-- TEN YEARS LATER

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In 1977, the authors of this paper undertook the development of a representative set of case studies of environmental studies programs in North American institutions of higher education. The collection was published, with summary and commentary, early the following year (Schoenfeld and Disinger, 1978) as the second entry in a six-volume, six-year series of Environmental Education Case Studies volumes sponsored by the ERIC Clearinghouse for Science, Mathematics, and Environmental Education at The Ohio State University.

Rather than attempting to set out a precise definition of the term "environmental studies," we chose in 1977 to list the factors or criteria that seemed to be implicit in its use by most institutions of higher education. That list included:

--Concern with the environment of humankind;

--Concern with the total environment;

--Concern with interdisciplinarity;

--Concern with problem-solving and the clarification of open-ended options, as opposed to "ivory tower" studies; and

--Concern with configurations that transcend traditional lines of endeavor, with central focus on the relationships between humankind and the total environment.

Our purpose in preparing the 1978 collection was not the development of a scholarly study of the status of post-secondary environmental studies programs at that or any other point in time. Rather, we sought to document the depth and breadth, with emphasis on the latter, of such programs in English-speaking North America. The purpose of developing the collection, then, was to locate and publish examples--who was doing what, and where, and why? How was it working? Would contributors be willing to tell it like it is, soft-pedal the sales pitches and feather-preening, and supply information which might actually be useful to others with similar programs, or seeking to establish them, or merely interested in the state of what appeared to be a developing art?

In developing that volume, we made no attempt to select a random sample. Only an outline was furnished to guide the preparation of reports; no questionnaire was included to support the development of summaries which might lead to statements of statistical significance.

Sixty programs were asked to summarize "what your program is, what it does, for whom, why, how, where it came from, where it's going, in what ways it is representative of developments in your field across the country, and in what ways it is unique, sources of funding, measures of performance, and so on." Forty-five of more than 50 responses were deemed of sufficient quality to be included in the published volume.

1987 Considerations

It may be a sign of recent and present robustness of post-secondary environmental studies programming that its practitioners have elected to develop and report on their own programs, rather than make the effort to summarize, classify, and otherwise characterize such programs en masse-genus, species, and behavior. It is interesting that none of the professional environmental education/studies organizations has attempted such a study, though Harde's doctoral dissertation (1982) did investigate several appropriate elements. Of course, it could indicate that those who prepare across-the-board surveys of areas of current interest have moved on to other, perhaps greener, fields, or even that the ghost is being given up. Nonetheless, it is interesting that the question continues to arise--what is the current state of the art in environmental studies in colleges and universities today? More or less? Better or worse? How have the programs which started a few years ago managed in terms of growth and survival? Are there discernable patterns of evolution, with respect to environmental studies programs? Are some types of environmental studies programming intrinsically more likely to survive than others? Do new environmental studies programs replace older ones? What happens when "the key man" retires or leaves? What happens under circumstances of general, university-wide fiscal retrenchment? Have successful interdisciplinary environmental studies programs which pose threats to traditional disciplinary units on campus been able to handle the heat, or have they been forced from the kitchen? Was environmental studies an academic fad, now passe or becoming so? Is survival and/or growth of environmental studies in the college/university setting contingent on its growing conformance to the trappings of traditionalism? And so on.

The Present Study

The present study does not provide definitive answers to these or related questions; there is no way that it could do so. As usual, case studies at best provide examples. The usefulness of the example is contingent on its representation of reality, and eventually on its replicability in situations where it is used as a model. But it is at best a model, not a paradigm.

Our approach to the development and analysis of our 1987 study was simple--let's track down those 45 programs which honored us by submitting case studies in 1977, then ask them to update their reports. Let's not go outside the original sample; we are well aware that there are a number of viable, interesting, reportable environmental studies programs which were not in our 1977 sample, either because they are newer than that or because we simply missed them the first time. However, they are outside our present scope.

The purpose of the 1987 study was to learn from program directors, etc., what changes--adaptations, mutations, expirations, whatever--have occurred in a specific set of programs over a ten-year period. Such generalizations as we were able to derive are summarized below. Because we did not follow standard research procedures, we can't lay claim to statistical validity of those generalizations. But we can and will suggest that they are worth considering.

A combination of mailed requests and phone calls unearthed 22 reports and 14 notes. A number of difficulties were encountered, many because of personnel changes--retirements, promotions, moves to other institutions, shifts in priorities, perhaps loss of interest or enthusiasm. But those difficulties actually are part of the story, as they must be in any longitudinal survey.

Similarly, many respondents were eager to participate in a follow-up, for reasons ranging from the personal satisfaction of being able to demonstrate programmatic and/or individual survival, to enthusiasm for current activities, to welcoming the opportunity to instruct others in the perils and satisfactions of operating environmental studies programs. We thank them all for their participation, and respect them for their dedication.

Responses

We have already stipulated that when only 22 fully responsive contributors emerge from a cohort of 45 possibles, you don't have a statistically defensible study. But perhaps those "no responses" and short notes are as indicative of what has happened or is happening as are the full papers. So let's summarize what we know about, or can extrapolate or interpolate from, those 23 "no responses" and short notes.

One: Through either their ineptitude or ours, we drew absolute blanks in five cases. Are those programs down the tubes? We don't know for sure, although from circumstantial evidence we suspect that some continue to exist in some form or another, while others may have folded their tents and silently slipped away. Because we have no data suggesting otherwise, we must assume for the purposes of this report that they are defunct.

Two: In two cases, we received an "I do not choose to participate" reply: "Too busy to write the paper," and so on. Such responses proved essentially impossible to interpret: the enthusiastic 1977 respondent may have been replaced by a less voluble successor, there may be embarrassment over the current condition of a formerly vibrant program, there may be nothing new to report, the respondent may actually have been too busy. Nonetheless, their survival is not assumed here.

Three: In three cases the reply indicated that, with the retirement or change in assignment of the 1978 author, his or her program disappeared into limbo.

Four: In four cases, the response explained that changes in fiscal verities, faculty priorities, or campus politics dictated a program's demise.

Five: In four cases, we were promised updated papers on surviving programs but found it necessary to close the books on the study before the papers materialized. In each of these cases, discussions with those non-respondents suggest that the operative word is "surviving," though lack of evidence leaves the question of level of survival unknown.

Six: In three cases, the reply suggested that a once-separate program has a continuing existence as a part of a newer, less focussed configuration.

Seven: In two cases, the reply indicated that the program is as alive and well as it was in 1978; lack of changes led to non-submission of a follow-on paper.

Then there were the 22 up-date reports. If our anecdotal data and our interpretation thereof mean anything, from the brightest perspective the environmental studies program survival quotient is .689--that is, 31 of 45.

A decade ago, on the basis of evidence at hand, we foresaw a bright, sustained future for interdisciplinary environmental studies programs in institutions of higher education. But we did suggest that our prediction might founder in the presence of three possible exigencies, all of which have been demonstrated in some situations:

First, since universities tend to be more atomistic than holistic in their approach to knowledge, interdisciplinary programs do not exist in a particularly benign reward system. Faced with a threat to its ordained territory, the retaliatory power of a traditional department can be awesome. The scalps of some of yesterday's environmental studies programs are undoubtedly dangling today on the belts of inflexible disciplines.

Second, were public and private support for higher education to decline, fiscal shortfalls could starve out campus configurations lacking well-cultivated constituencies. Starvation has indeed apparently overtaken some environmental studies programs, particularly in the absence of a nurturing federal administration.

Third, consumer protectionism may well have caught up with ill-conceived environmental studies programs that proposed to send their products out into a world of specialization with what Nash (1977, pp. 2-3) has called "the blunted lance of the well-rounded." Yesterday's emotionalism and cant have proved to be inadequate substitutes for tough, focussed substance in environmental studies programs at any level.

A *fourth* factor, which we didn't foresee, may have been at work as well. Some environmental studies programs may have fallen victim to the very hardening of the categories they were formed to alleviate, and thus failed to keep pace with the acceleration of change that is the inevitable concomitant of a high-tech society.

It may be all the more reassuring, then, that we found in those 22 papers, and some of the notes, clear evidence that enduring environmental studies programs continue to represent the very best in the posture of the modern American university, at once responsible for academic standards and responsive to public needs.

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NOTE: This paper is an extended abstract of the "Prologue" and "Epilogue" of *Focus on Environmental Studies*, a special issue of *The Environmental Professional*, volume 9 number 3 (1987), which was also NAEE *Monograph IV*. The 22 case studies and 14 notes providing the information base for this paper are included in that issue.

CINCINNATI'S HAZARDOUS WASTE INCINERATOR: A "NOT IN MY BACKYARD" CASE STUDY

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Background

In 1969, Commissioners of Hamilton County in southwestern Ohio in the United States were approached by members of the local chemical industries to find a suitable alternative disposal approach for hazardous waste chemicals. Pressures had been increasing due to citizens lawsuits against a county landfill to stop acceptance of industrial wastes. The Commissioners subsequently formed a non-profit corporation of the industries which had formerly used the landfill. The landfill was ordered to cease hauling industrial sludge the following spring. (Bonner and Petura, 1979) The Metropolitan Sewer District (MSD) serving Cincinnati and Hamilton County in southwestern Ohio announced plans in June 1970 for an industrial liquid waste incinerator or an alternative treatment approach. The original design goals of the incinerator emphasized three basic capabilities (Trapp and Riley, 1981).

Table 1. Goals of the Liquid-Fluid Incinerator (L/FI)

1. To accept and incinerate grit from primary grit chambers and shredded bar screenings produced by the adjoining sewage treatment plant.

2. To accept and incinerate skimmings from primary settling tanks.

3. To accept, store, mix, stage, and batch wastes from local industrial sources.

A rotary kiln thermal reduction system was selected for design and construction. Completed in 1977, the facility includes a material handling and storage area, control building, laboratory, and thermal reduction unit. Materials handling equipment included drum unloading and discharge facility (although delivery by drum is not encouraged) pumps, motors, nine storage tanks, and a tenth tank for caustic waste, a shredder, belt conveyor, and storage bin for solid waste. The tank farm consists of four

6,000 gallon holding tanks, and ten 25,000 gallon storage tanks, four 12,000 gallon storage tanks, and a 25,000 gallon fuel tank. Principal components of the thermal reduction unit are the rotary kiln, primarily used to burn sludges, waste skimmings, and solids, a cyclone furnace, a high energy venturi scrubber, an induced draft fan and stack for air pollution control, noise pollution and combustion controls. A hydraulic system handles residue from the rotary kiln, particulates from the scrubber, and any residue that may accumulate in the combustion chamber. The entire tank farm is housed on an apron with spilling and trench drains in the case of unloading spills. A foamite fire protection system was installed and nitrogen pumped into partially-filled storage tanks to resist combination of wastes with oxygen or spontaneous combustion. Exhaust gases from combustion equipment pass through quenches and a venturi scrubber, then to a try scrubber to remove particulates (Bonner and Petura, 1979). Minimum temperature of gases leaving the combustion chamber is 1090 C (2000F). Four batching tanks were provided for holding and mixing industrial wastes prior to burning. The ability to batch allows the facility to adjust waste heat values, alter viscosity, dilute corrosivity, and accept wastes with high Cl values (Trapp and Riley, 1981).

FIGURE 1

L/FI Industrial Waste Facility

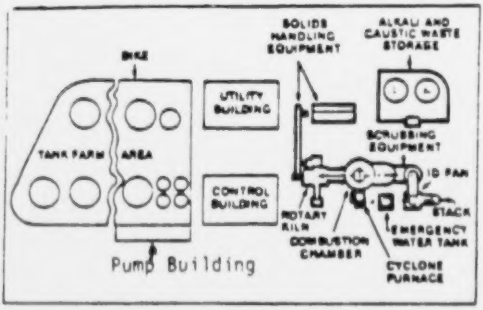
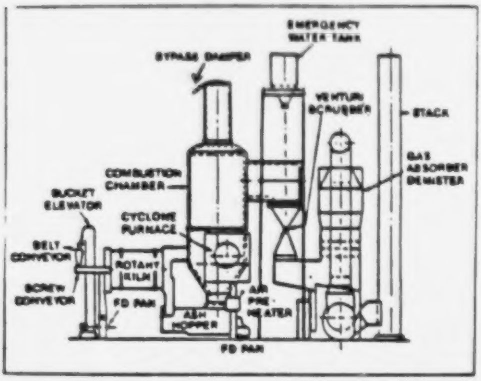

DIKE
TANK FARM
AREA
UTILITY BUILDING
CONTROL BUILDING
Pump Building
SOLIDS HANDLING EQUIPMENT
ALKALI AND CAUSTIC WASTE STORAGE
SCRUBBING EQUIPMENT
ID FAN
STACK
EMERGENCY WATER TANK
ROTARY KILN
COMBUSTION CHAMBER
CYCLONE FURNACE

FIGURE 2

L/FI Thermal Reduction Equipment


EMERGENCY WATER TANK
BYPASS DAMPER
VENTURI SCRUBBER
STACK
GAS ABSORBER DEMISTER
COMBUSTION CHAMBER
BUCKET ELEVATOR
CYCLONE FURNACE
BELT CONVEYOR
ROTARY KILN
SCREW CONVEYOR
FD FAN
AIR PRE-HEATER
ASH HOPPER
FD FAN

While the facility has accepted waste from throughout the county, and in fact needs such waste for optimal operation, wastes in the district were classified as lightweight hydrocarbons and nonaqueous solvents (paint thinners, aromatics), medium to heavyweight hydrocarbons (oils) low-water content aqueous wastes (sludges and starches, oils), dirty solvents, high-water content aqueous wastes (paint, enamel, lacquer, chlorinated hydrocarbons) skimmings from wastewater treatment plant, spent earth (water, oil, diatomaceous earth). The light hydrocarbons are important at start-up to assist fuel oil in initial heating to reach the high temperature necessary for adequate destruction of these substances. Thus, most waste is batched with this group to provide an eight-hour shift waste feed in tanks for the rotary kiln and cyclone furnace. The rotary kiln burns solid waste, sludges, and liquids, while the cyclone furnace burns liquids. The facility also has potential for energy recovery and conservation (Bonner and Petura, 1979; Brunner and Trapp, 1982; Riley and Trapp, 1982).

Discussion

The L/FI was the first municipal incinerator in the United States for industrial wastes, hazardous and non-hazardous. Approximately 40-60% of wastes were of local origin, but wastes were accepted from throughout the U.S. As a public facility, its operation was open to public scrutiny. But public scrutiny at a historical time when an uneducated public began to fear any facility or site connected with hazardous waste, was its undoing. To its advantage, the facility was sited in a heavily industrialized area on the property of the Metropolitan Sewer District adjacent to the sewage treatment complex, one-half mile from a major north/south interstate, and near major waste sources. But it was also located one-half to one mile from a low income, primarily appalachian neighborhood. The prevailing wind was away from the population center.

Table 2. Siting Considerations of the L/FI Hazardous Waste Incinerator

Near Source of Hazardous Waste Generators

One mile from major N/S interstate areas

One-half mile from dense population area

Prevailing wind (SW to NE) away from population center

Industrialized valley

The L/FI was a world class design facility. It had additional future potential for receiving solid landfill wastes and possessed state of the art safety features, yet it was beset with problems. First, it relied upon a steady waste stream requiring volumes higher than generated locally. Delays in obtaining parts, inflexible operating procedures within the large county bureaucracy, in addition to the sometimes insufficient waste stream could cause the facility down time. In the free market it is critical to remain price competitive. The hazardous waste field is no exception. But Ohio State law hindered management flexibility in this regard. Waste handlers also preferred to deal with a reliable facility. Down time means lost customers. Finally, state air pollution particulate standards are three times as stringent as federal standards. The Ohio EPA (OEPA) closed the facility on two occasions for violating this standard. Investigation, however, revealed that the particulates were non-toxic salts in lower amounts than persons living on a coastal area would be exposed to naturally (Table 3). This facility was also located in a primary non-attainment zone and was more vulnerable to OEPA action than industries from a political point of view. The sudden unexpected death of the director of the MSD resulted in a replacement who received constant lobbying from representatives of the adjacent community who feared exposure to incinerated wastes or explosions. As a result, the new director closed the facility. This decision has forced local industry to transport waste to far distances such as Arkansas, Pittsburgh, northern Ohio, Alabama, at much higher cost. Closure of the facility has also meant a tremendous loss of taxpayer revenue.

TABLE 3: PUBLIC COSTS OF THE MSD HAZARDOUS WASTE INCINERATOR.

Initial Construction

$ 3.5 million federal

$ 3.7 million local

7.2 million

$ 3.0 million post construction

$10.2 million (Subtotal)

$500,000 annual operating loss

(1982-86)

= $2.5 million

Ohio EPA test burns (2 @ $750,000)

= $1.5 million

TOTAL $14.2 million (+post closure costs??)

During the operation of chemical waste incinerators, potential exists for employee exposure to a variety of chemicals. If incineration is to be accepted as a viable method of toxic waste disposal, it must be operable without adverse health effects. A research study which included an evaluation of workers exposure to compounds most common to the L/FI upwind and downwind showed that the incinerator facility itself did not cause any increased organic vapor levels. Further, results of personal monitoring indicate exposures well within OSHA standards. General area and personal breathing zone samples were collected on charcoal tubes using Mine Safety Appliance. Compounds tested for included benzene, toluene, MEK and zylene. This study is important since the primary concern in operation of hazardous waste incinerators is fugitive emissions of improperly combusted chemical waste or new waste-derived compounds forming recombinations. The Science Advisory Board to the United State Environmental Protection Agency (USEPA) has urged a re-examination of indicator compounds in test burns, emphasizing that the current identification of several preselected compounds as part of test burn measurements of destruction efficiency does not constitute a reliable basis for developing exposure assessments. The Board also notes that test burns are usually made during optimal conditions.

A small contingency of local residents from a lower income neighborhood approximately one mile from the facility with a vocal spokesperson emerged to oppose the L/FI. The persistence of this group, particularly in working with the press, the sudden death of the director of the MSD and subsequent replacement of a successor (who was not supportive of the facility), the several closures of the facility by the OEPA for particulate violations caused the politically vulnerable county commissioners to vote on closing the facility (Table 4). Unfortunately, the USEPA was to utilize this facility as a test facility to learn more about efficiency of thermal destruction. (The largest USEPA Research Center in the United States is located in Cincinnati, as is the Solid and Hazardous Waste Research Division). Such test information could have proved invaluable to our understanding of the pollution potential of such facilities.

Table 4. Causative Factors Related to Closure of Cincinnati's Hazardous Waste Incinerator

Public Ownership

Ohio EPA Closures

Opposition by small, local community group

Dwindling local support from local industrialists

Change of MSD administrative leadership

Local industry waste reduction

Siting in primary non-attainment zone

Conclusions

There are lessons to be learned from the experience of the L/FI (Table 5).

Table 5. Conclusions

1. Privatization is still, perhaps, the most efficient approach although appropriate management in public or private is a key to success.

2. The size of a facility must relate to the waste stream for dependable waste destruction.

3. Citizens must be educated and involved.

4. OEPA and USEPA need long range and inter-agency planning.

5. A regional hazardous waste plan is needed.

Southwestern Ohio is still in great need of a liquid hazardous waste incinerator but to date, it appears that the L/FI capable in design, is destined to become a monument to the "Not in my Backyard" syndrome. It is also symbolic of a quiet crisis building in the accumulative solid and hazardous waste fields. Land storage is not a permanent answer. Waste reduction is an obvious necessity through such techniques as recycling, reduction, neutralization, but incineration of both kinds of wastes will remain a critically important destruction method. The education gap for citizens is understanding the links between desired usage of products and subsequent waste. This dilemma remains an enormous challenge for environmental educators.

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THE GREEN IGUANA IN A RURAL COMMUNITY: AN EXAMPLE OF ENVIRONMENTAL EDUCATION IN THE THIRD WORLD

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Environmental education is still a developing field in the Third World, especially in rural areas where education is most needed due to environmental and social problems caused by deforestation. This is not to say there is not an interest or an environmental movement. Rather, what is lacking is an approach that fits the social, cultural, and economic setting of the Third World where environmental education methods developed in North America do not always apply.

For the past two years we have been conducting a community environmental education program in the most deforested region of Panama, titled "The Green Iguana in the Rural Community: an Environmental Education Program for the Rational Use for a Renewable Natural Resource". As the title suggests the green iguana (Iguana iguana), as an endangered natural resource traditionally exploited for its meat and eggs, serves as an example for creating environmental awareness and action.

We base our education philosophy on the belief that environmental education in the Third World, to be relevant, accepted, and practiced, must be integrated with other development goals to improve the quality of life, rather than as a separate concept or entity. In addition, environmental education in this context should function as a grassroots process with the participation, knowledge, and opinions of the people as well as our guidance as environmental educators.

Before describing the approaches we created to implement our work, a brief background to our project will be presented.

For over 7,000 years the iguana has provided a valuable source of protein in the diet of humans. In recent decades, however, this herbivorous tree dwelling lizard has become endangered if not extinct throughout most of its range in Central and South America due to over hunting and destruction of its tropical forest habitat. Simultaneously, deforestation has also caused decline in the quality of life for the Latin American campesino, or peasant, due to impoverishment of soils, depletion of firewood, lumber trees, and many other economically important plant and animal species.

In 1983 the Iguana Management Project (IMP) began at the Smithsonian Tropical Research Institute in Panama, to investigate an alternative to this destructive relationship between man and nature. The goal of the IMP is to reintroduce iguanas into the diet of campesinos and the Panamanian countryside by restocking programs, management schemes, and education.

Two years of captive study of iguanas resulted in a good understanding of their ecology. This knowledge, plus a surplus population of iguanas were used to implement re-population experiments and environmental education in a rural Panamanian community.

Together with IMP director Dr. Dagmar Werner, we used both sociological and biological criteria to select the community of Chupampa, population 711, in the Herrera Province.

We required a community which a) was unified, active, and proud, and therefore more likely to respond, participate, and carry on with the proposed project when we are no longer around; b) was not too isolated so as to serve as a model for other communities; c) where the iguana is a traditional component of the diet.

We also required a site with an appropriate iguana habitat and an existing population of iguanas to be compared with the captive raised iguanas to be released.

After visiting over 50 communities, Chupampa was found to best meet our criteria with the bonus of Don Diego Gonzalez. Don Diego is an elderly campesino who has been protecting iguanas on his farm since 1952. After explaining the proposed project to him, Don Diego enthusiastically offered his farm for the iguana re-population experiment. Our impressions about Chupampa were supported by a sociological study we solicited from Panamanian sociologist, Francisco Herrera, about the history, structure, and traditions of the community. We also used questionnaires to assess local environmental attitudes and knowledge, and to plan, implement, and evaluate our work.

To implement our educational philosophy and work, we employed separate iguana and community centered approaches. We used the example of the iguana to create environmental consciousness by involving community members in the experimental implementation of iguana management techniques.

The iguana re-population experiment at the farm of Don Diego became our first environmental education classroom. The first release of captive raised iguanas was a public ceremony where local and regional authorities and villagers of all ages participated in the release of 219 juvenile iguanas into the surrounding vegetation. During the following months community members, especially children, assisted us in iguana censuses as we tracked their dispersion and noted their habits. We taught the children about iguana biology and how to record data, while they taught us the names of trees that iguanas prefer.

Public slide presentations about iguana biology and conservation were a popular method of introducing our educational work into the rest of the community. One evening after a presentation about the collection and incubation of iguana eggs, a previously unheard of concept by campesinos, the best iguana hunters in town approached us. They offered to capture live pregnant females in order to learn how to collect and incubate eggs. With their inspiration and collaboration we built a laying cage and installed artificial nests and incubators. Three months later, villagers excitedly gathered to witness the hatching of 115 iguanas. Today these former hunters have been incorporated as assistants in the IMP and have become avid conservationists and role models for children.

We began to integrate education into more specific community levels by forming a conservation club with the teenagers and by participating in the local elementary school. With the conservation club, we created an iguana exhibit and presented plays and songs with environmental themes at the local school.

Through our community approach we realized that developing environmental awareness and action also involves improvement of the community environment and quality of life. In order to understand and work with the community, we joined local organizations such as the public health and education committees. We helped to organize a malaria prevention campaign and to build an addition to the school. With local teenagers we built a bus stop shelter so villagers no longer had to wait for buses in the rain or the hot tropical sun. This project brought the youth recognition and employment in other construction jobs, and stimulated their continued participation in community activities.

Our participation in community life created greater trust among the villagers in our educational goals and in ourselves. We became not outsiders but community members.

Our goal to integrate environmental education with improvement in the quality of life was put into action through the creation of a community reforestation project. Trees are as important for iguanas and other wildlife as for human use in the provision of fruits, lumber, firewood, and environmental quality. The participation, knowledge, and opinions of villagers of all ages was included in each step of the process. The youth club implemented a questionnaire about which species should be planted, where, and how community members would like to participate. Meetings and interviews were held with experienced elders to collect additional information about knowledge and attitudes towards trees. With the enthusiastic support of the school director, Lola Urena, a nursery was established at the school and cared for by the students. Community members collected seeds and soil and three months later over 500 trees were planted by communal effort.

This is a summary of the experiences we have had over the past two years conducting an environmental education project in a rural community in Panama. We have tried to select experiences which best illustrate our educational philosophy to link environmental education with overall goals in improvement in the quality of life. We showed the approaches we created to stimulate the participation of community members of all ages in the project. While the iguana has served as an example for creating environmental awareness and action, we point out that other animals, plants, or ecosystems can also serve as an educational focus for similar programs elsewhere in the Third World.

Meanwhile in Chupampa, Don Diego, once scorned for his selfish attitude for prohibiting the hunting of iguanas on his farm, is now recognized as a pioneer conservationist. For the first time a generation of school children is growing up with an environmental consciousness formed by action. Former hunters have become conservationists and role models, and the iguana has become a symbol of community pride and progress.

WHAT TEACHERS GAIN FROM PARTICIPATION IN A RESIDENT EE EXPERIENCE

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What motivates teachers to take on the responsibility of participating in a resident environmental education program with their students? Participation in a resident experience takes a great deal of commitment on the part of teachers. They are away from home and other obligations, are asked to conduct classes in a very different teaching environment, and are often put in the position of chaperoning the students 24 hours a day. In spite of this increased responsibility, teachers volunteer to participate in these programs year after year. Understanding why some teachers do volunteer, what they feel they personally receive from the program, may help those who run resident centers to better meet the teacher's needs. Additionally, we may better understand what motivates teachers, in general, to include environmental education instruction in their classrooms.

To examine these issues, a questionnaire was distributed to all of the teachers attending the New Jersey School of Conservation during a five week period. Of the 100 questionnaires distributed, 72 were completed and returned. All responses to the questionnaire were analyzed using factor analysis.

Participating teachers were asked a series of questions that focused on their experiences at the resident center, including those things that bothered them about involvement in an outdoor experience and those things that they found satisfying or enjoyable when participating in the resident environmental education program. A number of questions concentrating on the teacher's general perceptions concerning environmental education were included as well.

Three factors (Table 1) concerned the teacher's general attitude toward environmental education as a part of the curriculum. On the whole, the results indicate that the teachers saw environmental education as playing a valuable role in the school program. The factor "Importance of EE," with an overall mean of 4.2, reflected the sense that environmental education is considered an important part of the curriculum. Generally, the teachers rejected (with a mean of 2.1) the idea that "EE is Not as Important as" other aspects of the curriculum. Likewise, teachers were not apt to feel (mean=1.3) that the resident environmental education program particularly disrupted the overall school program.

Three factors related to those benefits that teachers felt they personally gained from participating in the resident environmental education program. The factor "Nature/Enjoyment" (mean=4.5) includes a number of items that describe positive outcomes of participation and in particular, reflect enjoyment gained from being in the outdoors. The "Positive: Social/Self" factor (mean=4.3) reveals a sense that the experience enables the teachers to grow personally and socially, giving them a chance to get closer to their students and to other teachers, while also allowing them to learn more about the environment and about themselves. The final factor in this group, "Challenge" (mean=4.2), reflecting a theme of testing or stretching oneself. They felt the resident program was challenging, stretched their abilities, and re-invigorated them.

It is important to recognize that teachers can and do personally benefit from the resident environmental education experience. Often, because the focus is on the students and their experience, we lose sight of the teacher as an integral part of the program. As is evident from the above data, the participants in this study see the experience as providing some personal benefits.

Although five factors (Table 1) identify disadvantages or concerns about participating in a resident environmental education program, the mean ratings on all of these factors (ranging from 1.1 to 2.0) are quite low. Of the five sets of concerns, the one with the highest rating related to being "Away from Responsibilities" at home (mean=2.0).

Two of the factors involve fears or worries about teaching in the outdoors. "Negative: Physical/Fears" (mean=1.6) relates to anxiety regarding the rigors of teaching in a field setting, including getting lost, not being able to keep up physically, and not teaching as well as one of the resident staff. Additionally, "Fears: Teaching Ability" (mean=1.4) reflects worries that relate directly to those teaching skills required in a field setting such as not knowing the answers to the students' questions and not being able to fill up all of the time allotted.

Finally, two of the factors surround potential concerns about self. "Negative: Time/Self" (mean=1.5) includes misgivings about not having enough time of their own and losing some of their privacy, while "Vulnerability," with the lowest mean (1.1), concerns looking foolish and worrying about getting too close to the students.

The Question of Responsibility

The teachers' overall endorsement of EE is somewhat lessened, however, when they are asked whether incorporating environmental education into the curriculum is their responsibility. Although the mean rating on this item is not low (mean=3.9), it does reflect a slightly less enthusiastic and significantly lower (at the .05 level) endorsement when compared to their feelings about the general relevance of environmental education.

Interestingly, the teachers were split on this question and when the item is used as a predictor (Table 2), one half of the factors show significant differences. Those who considered it their responsibility as a teacher to incorporate environmental education into the curriculum consistently rated their own experience in more positive terms, and were less likely to feel that environmental education is not as important as other subjects in the curriculum, than those who did not consider it their responsibility.

This result is disturbing on two levels. The first, of course, related to the concern that teachers, even those participating in a resident environmental education experience, do not necessarily believe that it is their responsibility to teach environmental education in their classrooms. Often, there is an assumption that if we can only get teachers involved in environmental education, they will take up the banner. Unfortunately, this does not seem to be wholly true. Participation alone does not guarantee a sense of responsibility or commitment.

The concern is only increased when one considers that those who do not hold that teaching environmental education is their responsibility may be less likely to chose to participate in additional activities with their classes. If they believe that it is not as important as other subjects or that it is more appropriate as an extracurricular activity, it must be assumed that they would be less enthusiastic supporters of environmental education in general. Unfortunately, this assumption is supported by the data. Teachers who felt it was their responsibility to incorporate environmental education into their curriculum were significantly more likely to take their classes outside to use the school site, to nature centers, and to nearby natural areas or local parks than those who did not see it as their responsibility (Table 2).

Conclusions

An overriding question of this study has been why do teachers participate in resident environmental education programs. By examining what motivates people one gains a clearer sense of how to encourage and nurture that behavior. Obviously, the teachers feel that environmental education is an important part of the curriculum and participate, in part, to provide a positive experience for their students. It is also evident that to some degree teachers participate in these types of programs because they provide opportunities for personal and social growth. It is important to recognize that the program provides teachers with a personal growth experience and that this opportunity may play a role in maintaining their enthusiasm for the program. It is equally important to continue to explore this question, to better understand what contributes to this sense of growth, and to determine how it can be nurtured both at the resident facility and back at the school.

It is quite obvious that we cannot assume that teachers believe that environmental education is their responsibility; consequently, we must consciously make an effort to provide teachers with a rationale for incorporating environmental education into their classes. Working with teachers in training sessions and providing preparatory and follow-up lesson plans afford additional opportunities to show teachers concrete examples of how environmental education can be integrated into their own regular classroom activities.

NOTES: A majority of the respondents to the study questionnaire (84.7%) volunteered to participate in the resident program. For a much smaller number (15.3%), participation was mandated by their teaching contact.

A longer version of this paper appeared in The Journal of Environmental Education.

TABLE 1
THE TEACHER'S EXPERIENCE

Factor	Mean (n=72)	Component Variables
Role of EE:		
Importance of EE	4.2	EE my responsibility as a teacher, EE an important part of the curriculum, EE not just another subject to be fit into a busy schedule (reversed scale)
EE: Not as Important As	2.1	EE not as important as the basics, EE more appropriate as extracurricular, mostly responsibility of science teacher(s)
Disruption of EE	1.3	resident program is disruptive to school schedule, resident program hard to justify
Perceived Benefits:		
Nature/Enjoyment	4.5	gives me a chance to stop and appreciate nature, gives me time to be outdoors, makes me feel good, is fun, gives me a chance to be with other people who care about the same things I do
Positive: Social/ Self	4.3	time to get closer to other teachers, nice change of pace, time to get closer to students, chance to learn more about environment, chance to learn more about self
Challenge	4.2	challenging, helps me make a contribution to environment, reinvigorates, stretches abilities, lets me be a role model
Perceived Drawbacks:		
Away from Responsibilities	2.0	being away from family & obligations
Negative: Physical/ Fears	1.6	worry about - getting lost, not keeping up physically, not teaching as well as staff, too much exercise
Negative: Time/Sel	1.5	worry about losing privacy, not having time of own, being outdoors all the time
Fears: Teaching Ability	1.4	worry about losing control of the students, not knowing the answers, not being able to fill up time, doing something embarrassing
Vulnerability	1.1	worry about looking foolish, getting too close to students

TABLE 2
EE: RESPONSIBILITY AS A TEACHER

Factors:	EE: Responsibility as a Teacher		signif
	low	high	
	n = 29	n = 36	
	(mean = 2.6)	(mean = 4.5)	
Perceived Benefits/Drawbacks:			
Nature/Enjoyment	4.0	4.5	.01
Positive: Social/Self	3.9	4.4	.03
Challenge	3.6	4.4	.01
Fears: Teaching Ability	1.6	1.3	.000
EE: Not As Important As	2.6	1.8	.000
Incorporating EE into the Classroom: *			
use of outdoor school site	2.0	3.0	.03
use of nature centers	1.8	2.2	.05
use of nearby natural areas	1.4	2.1	.05

* scale - how often do you take your class: 1 = never; 2 = once a year; 3 = 2-3 times a year; 4 = 4-6 times a year; 5= more than 6 times

PLANNED CHANGE AND ENVIRONMENTAL EDUCATION: AN IMPLEMENTATION SUCCESS STORY

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> The philosophers have only interpreted the world in different ways: the point, however, is to change it.
>
> Karl Marx

This paper discusses the field of planned change, and its important implications for environmental education. I believe it is crucial for those of us involved in environmental education (EE) to look much more closely and critically at not only what we believe "good" EE to be, but how we intend to achieve these aims.

I'll begin by discussing the importance of looking at EE from a planned change perspective. I'll then describe the findings of my own research, which investigated the successful implementation of a supplementary EE program.

Environmental Education and Planned Change

Human social change, or more specifically, methods of directing social change, has been an intense field of study for decades; with contributors as diverse as Karl Marx, John Dewey, and Paolo Friere.

Planned change, a specific area in this field, concerns the philosophies and strategies of applying knowledge to human affairs in order to promote intelligent action and change. Most researchers identify four broad stages in the planned change process: initiation, adoption, implementation, and continuation.

I first became aware of the need for information about change strategies for EE after working on an extensive marine education program in Newfoundland. The program was developed by teachers, locally relevant, and endorsed by the Dept. of Education. However, a survey conducted a year later showed that although every elementary school in the province had the program, it was being used only sporadically. This discovery was a real blow to a rookie curriculum developer, as you can imagine! However, I found very similar scenarios when I began looking at the educational change literature; a majority of innovations of all types sit unused on library shelves, and are rarely implemented.

Implementation is the key process here, the stage of change that moves an innovation from ideas into action. Virtually all of the change literature points to the same conclusion; Implementation dominates the process of change. As the large scale, six-year Rand Study of Innovation in schools states: "Implementation strategies made the difference between the success or failure of an innovation, almost independently of its content or educational method" (Berman & McLaughlin, 1978, p.viii).

Implementation has been recognized as the most important step in the success of educational innovations since 1970 (Berman, 1981; Goodlad & Klein, 1970: Williams, 1976). However, in spite of the large number of studies on change and implementation over the last 15 years, there seem to be few hard and fast rules for promoting success. As Bennis states:

> What we know least about--and what continually vexes those of us who are vitally concerned with the effective utilization of knowledge--is implementation. (1976, p. 175)

The implementation process is obviously critical to those of us committed to change in environmental attitudes, values, and behavior through environmental education. In an age where humans need to understand and apply scientific and environmental knowledge as never before, the lack of actual use of environmental programs could mean more than just an in-complete education: it could eventually spell environmental and planetary disaster. Although there has been a large increase in environmental programs and curricula over the past two decades, there has also been growing concern over the materials' actual use by teachers (Johnson, 1980; Roth, 1976).

However, incredulously, research on implementation and change strategies for environmental programs is virtually non-existent. Most environmental education programs in Canada today are supplementary, voluntary, and poorly funded, making them even less likely to be used than compulsory programs, as they possess no political, economic, or legal backing to aid them in navigating the perilous course of implementation.

An Implementation Success Story

In order to counter this bleak picture of implementation, I decided to take a more positive approach and study a success story. I investigated the successful implementation of the supplementary EE program "Salmonids in the Classroom" in a large urban school district in Vancouver, B.C. (Staniforth, 1987). I wanted to find out why this environmental program, among countless others, succeeded in the implementation struggle.

Briefly, "Salmonids in the Classroom" is an extensive, supplementary, multi-disciplinary curriculum developed by the federal Dept. of Fisheries & Oceans in 1978. The program looks at salmon in B.C.: their biological, economic, and cultural aspects. The package consists of a large ring binder of lessons, student activity sheets, and overheads. The lesson plans are structured, knowledge-oriented, and teacher-directed, with some "hands-on" activities presented as optional materials.

I spent about 8 months in the district, interviewing teachers, students, administrators and parents, and observing all aspects of the salmon program, in order to get a thorough picture of the program's implementation process. What follows is a brief summary of my major findings.

Perhaps the most significant factor I discovered early on was that none of the teachers I talked with used the original program materials much at all. Instead, their salmon program focused on the in-class hatchery, an activity limited to an optional section in the original materials.

Four main factors stood out from the salmon program's implementation, and seemed to form the backbone of its success.

District Support. The district's two assistant superintendents were the program's primary initiators and supporters. They involved teachers early in program planning, provided free program materials, made efforts to involve the local community, and established a resource teacher network, a group of teachers experienced with the hatchery who gave workshops, helped new users get started, and set up an "on-call" trouble-shooter service. This network laid the groundwork for the program's success.

The district had a flexible and democratic implementation strategy, which allowed for "mutual adaptation", a key factor in successful change. The program was adapted to the realities and resources of the local environment, while teachers adapted to learn how to use it. (Berman & McLaughlin, 1978; Fullan, 1982).

The Value of the Program to Students. The main reason stated by all teachers for using the salmon program was its perceived value for their students. A teacher's main indicator of a program's success is their students' reactions to it. The hatchery generated alot of student interest and involvement. Good student responses were also the main source of rewards and recognition teachers received for using the program.

Personal Interest in the Program. Personal interest at the district and teacher level initiated the program's adoption. The hatchery was unique and interesting, it held meaning for teachers, and for the community in general. Also, teacher's interest in the program encouraged them to press on through any initial problems, and provided personal rewards and enjoyment.

Peer Interaction. Peer interaction was initially stimulated by the resource teacher network, where teachers learned from each other and supported each other. Good working relationships were developed, that enhanced socialization, the sharing of ideas, and problem-solving. This interaction helped to build a sort of informal "salmon club" of users, that aided the personal/interpersonal nature of the change process.

Several of the study's findings disagreed with the major research on change.

--Clarity of program goals essential for implementation (Doyle & Ponder, 1977-78; Fullan, 1982). My study indicated that program users were either unclear or unaware of the original program's goals, yet they all had their own objectives for using the program, which were quite clear.

- --The principal plays a crucial role in implementation (Sarason, 1982; Wang, 1984). In this study the assistant superintendents assumed central roles in the change process--principals were essentially bypassed, and the program brought directly to the teachers.

- --Teachers must be involved with the program's development, in order to use it (Berman & McLaughlin, 1978; Fullan & Pomfret; 1977). None of the program users I worked with had been involved in the program's development, although some had helped with its initial implementation.

- --Teachers must have the background knowledge and skills corresponding to an innovation before they will implement it (Berman & McLaughlin, 1978; Fullan, 1982). Over 30% of the teachers I spoke with had no background in science or environmental studies, yet, prompted by the success of the program in other classes and by the support of the resource teacher network, they had adopted and were using the program.

These discrepancies are significant, I think, as they oblige us to continually question the established premises in change research. We have much to learn about this complex process; there is no "one way" to effect change.

In summary, the process of implementation is central to the success of environmental education programs. Successful implementation requires knowledge of the change process, its effects on all individuals involved, and opportunities for those individuals to develop the knowledge, skills, and understanding that their new roles require.

Environmental program developers have followed the lead of many other educational innovators in solving problems: the cure is to add something more to the classroom. The "why" and "what to change" have been elaborated upon in great detail by environmental educators: it is high time we began to look at "how" to change as well.

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OUTDOOR EDUCATION FOR STUDENTS WITH DISABILITIES

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Benefits for Students

Outdoor education is a way of teaching and learning that is based on accepted principles of learning. It provides direct, concrete learning experiences in the outdoors, experiences that enhance the social, emotional, cognitive, and physical development of students. Enhanced self-concept, increased awareness of the responsibility for the natural environment, improved academic skills, language skills, social interactions, and physical skills as well as enhances creativity and development of lifelong leisure interests and skills are important outcomes of outdoor education (Donaldson & Goering, 1972). Outdoor education can provide the same benefits for students with disabilities regardless of the type or severity of the disability, if instruction regardless of the type or severity of the disability, if instruction is appropriately designed to meet the learner´s unique needs. A review of the literature indicates that professionals from many fields consider outdoor education to be a viable instructional process for meeting the individual needs of students with disabilities. Outdoor education is cited as benefiting students´ emotional, social, physical, and cognitive development.

Emotional development. Benefits in the emotional area include development of a more positive self-concept, development of self-reliance, enhancement of self-confidence and independence, and improvement of attitudes toward others--peers, teachers, and other authority figures (Brannan, 1979; Byers, 1979; Keller, 1980; Lane, Bonic, & Wallgren-Bonic, 1983). Often students with disabilities, because of visible differences and failure to achieve academically and socially, develop negative attitudes about themselves. The traditional classroom environment with the majority of tasks based on reading and writing assignments perpetuates this feeling of failure. The outdoor classroom, however, does not have the negative stimuli that the indoor classroom possesses (e.g., extensive reading material may not be required for outdoor activities). By becoming involved and interacting with the environment, success experiences can be provided for these students as a means of enhancing self-concept (Dustin & Daly, 1978; Rawson, 1978; Sessoms, 1979). As students have success experiences through involvement in cooperative outdoor activities, as compared to more competitive activities that occur in the classroom, their self-confidence in both academic and social areas increases. Students begin to develop independent and self-initiated behaviors while interacting with the environment. Improved self-concept and increased self-confidence in social academic areas also results in more positive attitudes toward peers and authority figures (Brannan, 1979; Dustin & Daly, 1978).

Social skills. As students with disabilities participate in outdoor programs, social skills are strengthened. Students begin to develop better interpersonal relationships with peers and adults, to work more effectively within a group (Lane, Bonic, & Wallgren-Bonic, 1983), and to acquire recreation/leisure skills (Wuerch & Voeltz, 1982). Research indicates that for students with disabilities to effectively learn appropriate social skills, they must be involved in cooperative group learning experiences with peers who do not have disabilities (Johnson & Johnson, 1986). Outdoor education fosters social development as interdependence and interactions with peers and adults occurs in a group situation. The informal, relaxed outdoor environment promotes trusting relationships and increases respect for others (Brannan, 1979; Byers, 1979; Keller, 1980; Marini, 1978).

As part of social development, disabled students must be taught to utilize free time meaningfully. Many have difficulty in adequately filling leisure time with profitable activities without appropriate training (Wuerch & Voeltz, 1982). The outdoors provides an excellent environment for acquiring necessary skills for leisure and recreational pursuits. These skills can be acquired through field trips, outdoor education activities, community programs, and residential or day camp experiences.

Physical development. Physical benefits include improvement in physical fitness, perceptual-motor skills, and body image; acquisition of physical skills; and development of self-help and survival skills. Students with disabilities often have inadequately developed physical and perceptual-motor skills resulting from lack of involvement in physical activities. Because of a variety of highly motivating outdoor activities that allow the student to explore and move freely in the outdoors, skills development occurs in the areas of gross and fine motor movements, mobility, spatial awareness, balance, and tracking (Brannan, 1979; Marini, 1978). Involvement in physically based learning experiences, especially those which promote recreation and leisure interests, leads to the development of physical skills necessary for participation in sports and games and results in improved physical fitness (Swenson-Pierce & Kohl, 1986).

As students observe and explore in the outdoors, an awareness of the relationship between themselves and the environment develops. Students' perceptions of themselves and their bodies improve (Keller, 1980; Marini, 1978). Likewise, outdoor experiences foster the development of self-help and survival skills. Especially in residential programs, students are involved in activities such as dressing themselves, assisting with meals, and setting up camps, which help them develop skills necessary for everyday living.

Cognitive development. Finally, students with disabilities benefit from outdoor education in the area of cognitive skills development as indicated by improved academic achievement and school grades (Krieger, 1973; Rawson, 1978). Rawson (1978) demonstrated that students with behavior disorders could change their math scores on a standardized achievement test (an average gain of three months, and for reading scores an average gain of six months) after participation in a residential camping program.

Benefits for Educators. Just as outdoor eduction provides many educational benefits for students, it also offers specific benefits for educators. The use of outdoor experiences aids in individualization, encourages interdisciplinary planning, helps to remove barriers between students and authority figures, decreases discipline problems and aids in student motivation and creativity.

Individualization. Students with disabilities differ in their social, physical, and cognitive abilities; therefore, instruction must be adapted to meet the learner's individual needs. The outdoor environment offers a variety of tasks, settings, and materials which can aid in this individualization. As a learning environment, the outdoors allows educators to provide for individual or group experiences in concrete as opposed to abstract situations. For many disabled students, skill development occurs more readily in this type of learning environment. When providing instruction in the outdoors, educators are able to individualize more effectively by using more nontraditional teaching approaches, by incorporating fewer reading activities for students with reading problems, by utilizing large and small group instruction and by using peer tutors (Stayton, 1986).

Interdisciplinary teaching. Because outdoor education is an interdisciplinary approach to instruction which cuts across all subject areas, each of the educators involved in providing the student's educational program can provide instruction through outdoor activities. Use of the same instructional approach leads to more effective planning and cooperation between professionals. Utilization of the same instructional approach also adds to the consistency of the student's instructional program.

Removal of barriers. As more appropriate instruction is provided, barriers between students and authority figures begin to disappear. The educator's role changes to that of a facilitator and learner in the outdoor classroom. Along with the role change comes increased rapport and interaction with students (Lane, Bonic, & Wallgren-Bonic, 1983).

Decreased discipline problems. With improved educator-student relationships and appropriately designed instruction, discipline and behavior problems decrease. Information presented in the outdoors is often more interesting and relevant to students; therefore, students get involved in activities and spend less class time creating disturbances. Also, many classroom behavior problems are a result of frustration from failure.

Success in outdoor activities removes this need to gain attention through inappropriate behavior, resulting in more socially appropriate classroom behaviors (Rawson, 1978). Thus educators can spend more time instructing and less time managing behavior.

Increased motivation and creativity. Finally, outdoor education benefits educators by increasing student motivation and creativity (Keller, 1980). Students are eager to learn if activities are highly stimulating and relevant. Outdoor activities require students to utilize skills in real situations (e.g., measurement and other math skills may be required to build a trail). Creativity may also be enhanced as students are allowed to test solutions through trail and error, to ask questions, and to move freely while interaction with other students.

Summary

As an interdisciplinary instructional approach, outdoor education provides students with disabilities learning experiences in the outdoor environment. Outdoor education programs have evolved from what were primarily camping programs in the early 1900's to programs in the 1980's that use school and community sites to provide appropriate instructional programs designed to meet individual student's needs. With an increase in programs and increased evaluation of those programs, specific benefits for students and educators are identified as resulting from the availability of outdoor experiences for students with disabilities. These benefits provide a rationale for incorporating and maintaining outdoor education as a viable instructional approach in the schools of the future.

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PROVIDING A SOLID FOUNDATION FOR OUTDOOR EDUCATION: A NEW CALIFORNIA STATE DOCUMENT

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The new California Outdoor School Curriculum Guide provides a comprehensive document on resident outdoor school programs. In these programs, students, usually in grade 5 or 6, have the opportunity to live and work together in an outdoor setting for four nights and five days.

This guide is divided into three useful sections, which are summarized below.

Section 1: The Outdoor Education Perspective

This section addresses the informational needs of administrators and curriculum specialists. It includes a definition of, and outcomes for, outdoor education; a description of a resident outdoor school; a review of relevant research and learning theory; and consideration of ways to magnify the impact of outdoor school.

The new, comprehensive definition of outdoor education, in which the resident outdoor school functions as the key component, is:

> Outdoor education occurs in a unique learning environment where students experience firsthand, action-oriented learning which takes place primarily in the out-of-doors at a resident school site. All curriculum areas are utilized to increase awareness, knowledge, and attitudes, and to develop critical thinking skills and actions related to the physical and biotic environment. The objectives for students are: 1) to practice skills in making rational decisions in group living and work settings and to evaluate personal consequences; and 2) to develop knowledge, positive attitudes, appreciations, and action behaviors involving the stewardship responsibility of people for natural resources. The outdoor school curriculum is supported and strengthened by carefully selected activities performed by students in the regular classroom and at home before and after the intensive outdoor experience.

Resident outdoor school programs provide enjoyable, discovery-oriented learning environments which have been shown to demonstrate these goals:

--To develop understanding of ecological concepts:

The student learns meaningful concepts about life, physical, and earth science through actual experiences in outdoor activities.

--To promote positive attitudes toward the out-of-doors:

The student finds a deeper sense of serenity, inspiration, and spiritual well-being as he/she becomes aware of the beauty, the majesty and the exquisite order of the natural surroundings.

--To facilitate intergroup respect and understanding:

Students, coming from separate schools, different economic levels and varied social, racial and cultural groups, gain increased understanding and appreciation of each other as they live, work, study, and play together.

--To improve peer socialization:

The student recognizes the worth of group action in planning solutions for problems, sharing ideas, settings standards, and evaluating the results of planned activities.

--To promote positive self-concept:

The student feels an added sense of worth and importance as he/she engages in activities that contribute to the success of everyone involved.

--To support personal growth:

The student gains a feeling of self-sufficiency and growth as he/she masters new skills and learns to take care of own health and safety needs at the Outdoor School.

--To stimulate critical thinking:

The student acquires an interest in, and problem-solving skills related to, conserving natural resources.

--To improve relationships between teacher and students:

Students and teacher gain new insights about each other, thus improving subsequent classroom relationships.

The goals are achieved because outdoor education is success-oriented. Students spend their time doing activities, rather than just reading and discussing. Students of all academic abilities are motivated by the active approach and experience success. They do activities at outdoor school which cannot be accomplished in the regular classroom. In this curriculum, students experientially study books without covers: the land, water, heavens, plants, and animals. The curriculum at outdoor school:

--Involves action and "hands-on" learning--working, playing, exploring, discovering, creating, conserving, sharing, evaluating, and problem solving.

--Uses a multi-sensory approach to promote curiosity and develop a compassionate attitude toward the environment.

--Is centered around the students' needs and interests.

--Includes experiences of many types which stimulate new interests.

--Promotes intrinsic motivation through use of the immediate natural environment.

--Includes integrated experiences that meet the California State of Education goals and objectives in all curricular areas and emphasize the interrelationship of subject matter areas.

--Uses the processes of science--observing, communicating, comparing, organizing, relating and inferring.

A review of relevant research validates the successful outcomes for students from the resident outdoor school experience. The contributions of outdoor education in the affective domain are significant. The potential for good human relations is provided in countless ways at outdoor school as part of the total living environment. Consideration of others and understanding of self are involved in desirable social and democratic behavior. In terms of cognitive development, outdoor education has the support of several studies which suggest its importance in developing environmental concepts and increasing critical thinking.

Section 2. The Curriculum for Resident Outdoor School

This section outlines the core curriculum for outdoor school and includes activities for before and after outdoor school.

The core curriculum was developed on the basis of a survey of California outdoor school administrators and a review of curriculum documents. The outdoor school curriculum is correlated with state-mandated learning outcomes for the following subjects: science, history-social science, English-language arts, mathematics, health, physical education, visual and performing arts.

Sample student lessons for before and after outdoor school are provided which are effective in providing students with a comprehensive outdoor education experience. Lesson plans for before outdoor school include: journal writing; photosynthesis and food chains; food webs and other interrelationships; adaptations; outdoor school trail manners; and planning for outdoor school. Lesson plans for after outdoor school deal with: my outdoor school experience; comparing outdoor school and school yard environments; changes in habitat; school site improvement; and history of the local environment. Also included are suggestions for incorporating technology (computers, video, and laserdisc) into the total learning program.

Section 3. Parental Involvement with Outdoor Education.

This section articulates to teachers and administrators effective avenues to involve parents in supporting and facilitating the outdoor education program. Parent support is essential for two reasons: a) initial orientation and commitment to the concept of outdoor school; and b) engagement in home activities that support and extend outdoor school learnings. Guidelines are presented, along with suggested learning activities.

Information on acquisition of this document can be obtained from the author.

SEARCH FOR EXCELLENCE IN ENVIRONMENTAL EDUCATION

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Overview

In the sixth year that the National Science Teachers Association has identified exemplary programs in science education, environmental education was selected as one of the searches (1986-87). A committee in each state publicized the criteria and sought out programs that best fit the criteria. These programs subsequently became the nominees for national recognition. The members of the original task force which established the criteria of excellence in environmental education served as the selection panel for identifying the ten national exemplars.

Criteria for excellence in environmental education included the following components:

--The Goal:

To develop and practice creativity and critical thinking along with values analyses. Teachers and learners will search for alternative solutions to environmental issues and evaluate the ethical, social, ecological, and economic costs and benefits of alternatives. Effective environmental education depends on multidisciplinary instruction but has a strong science component. It involves direct contact with environments as well as vicarious experiences. The learner grows from awareness and understanding to concern and action.

--The Curriculum:

1. provides activities and information to interest learners in the interactions between people and environments;

2. develops, in learners, the intellectual tools to effectively explore the world around them; and

3. directly involves learners in investigating the world around them and their relationship to it.

--The Instructions:

1. fosters open minds and the generation and examination of alternatives;

2. stimulates and fosters creativity and critical thinking;

3. respects the social, intellectual, and developmental maturity of learners;

4. links science with other areas of intellectual and emotional activity;

5. provides opportunities for learners to be involved in environmental activity at an appropriate level of challenge; hence, fosters a growing sense of confidence that groups and individuals can positively affect the environment; and

6. relates the components of the ecosystem to our health, well-being, and potential for development.

--Effective programs:

1. provide evaluation based on stated goals, objectives, and outcomes;

2. include field testing of programs and materials in terms of stated goals and objectives; and

3. have continuous modification and feedback.

Programs selected as the national exemplars in environmental education, along with the contact person, are the following:

James A. Kolb Marine Science Center Poulsbo, WA	Zoneth Overbey Kimbark School San Bernardino, CA

Sharon Hackley
Palo Christi Elem. School
Kingman, AZ

Michael Specht
Nathan Bishop Middle School
Providence, RI

Janet Thomson
Great Falls Public Schools
Great Falls, MT

William Hammond
Lee County Schools
Fort Myers, FL

Edward J. Zero
BOCES III of Suffolk
County
Smithtown, NY

Jane L. Person
East Stroudsburg Area
School District
Stroudsburg, PA

Rosemary Pearson
Berwick Alternative
School
Columbus, OH

Sidney Stephens
University of Alaska
Fairbanks, AK

Description of Kimbark's Program--A National Exemplar

Since 1977, Kimbark Elementary School has been a magnet school for the desegregation and integration program in the San Bernardino City Unified School District in California. Providing a comprehensive, articulated K-6 environmental education program, the Kimbark Environmental Education Program (KEEP) involves not only science-based, interdisciplinary environmental education, but also offers outdoor experiences which give students a cognitive and affective basis for making life-style decisions. The program's objectives are to promote awareness, appreciation, understanding, and knowledge of the interrelationship between one's self and one's total environment. Leadership in this program has been provided since its inception by Mr. Zoneth Overbey, principal and environmental resource teacher.

There are two modes of instruction: classroom and pull-out. On-campus resource sites, utilized in both modes, include pond, greenhouse, lath house, weather station, amphitheater, and garden. These on-campus resources were constructed and continue to be maintained by students, staff, and community volunteers. Each grade level studies a different environmental curriculum area and carries out a unique class project utilizing campus resources. The pull-out instruction provides enrichment on basic concepts covered in the classroom instruction. Examples of pull-out activities are using computers with science software, gardening, pond study, monitoring of the weather station, observing birds and other animals, and nature trail.

Kimbark has a resource room of environmental education materials and an extensive collection of computer software. The library is unique in its emphasis on nature books, as is the reading laboratory for basic skills which uses environmentally-related materials.

To enrich and enhance the science program, volunteer representatives from local agencies (Department of Fish and Game, Humane Society, 4-H, etc.) and California State University at San Bernardino share their expertise.

The San Bernardino Museum officially adopted Kimbark in 1985. A history of mutual assistance preceded this event. Kimbark staff and fifth and sixth grade students have developed an off-campus nature trail and teaching sites on 48 acres owned by the Museum. In turn the Museum has loaned plant and animal specimens and provided speakers and technical assistance as needed.

Another off-campus site used by fifth and sixth grade students each Spring is an outdoor school in the local mountains. The Kimbark teachers design and conduct the outdoor school program.

The environmental curriculum and class projects at each grade level have changed slightly over the years based on the campus resources available and the interests of the teachers. Examples of environmental science curricula follow.

In kindergarten and first grade, students study birds, community, farm animals, ocean and mountains. Theme days and weeks are commonly used to easily incorporate all the curriculum areas while the students learn about the environment. Particular favorites are Ground Hog Day and Spider Week at Halloween.

In second grade, the desert is studied using the multi-media kit, Sand In Your Shoes. Speakers, plus items borrowed from the museum, are also used. A plant unit involves the use of the greenhouse.

In sixth grade, the science-based instruction on pollution combines textbook and experiments. Math is included by estimating the area range that one drop of oil has in a pan of water and then extrapolating this to a real oil spill. In language arts and social studies, the students read relevant newspaper articles and write ecologically oriented essays. Students use critical thinking skills to consider their own actions related to pollution.

Students who attend Kimbark attain a comprehensive education in environmental science, ranging from vocabulary and concepts to applied hands-on experiences, that is not afforded in a typical instructional program. This enables our students to function now and in the future with an expanded awareness of themselves and their place in the world.

The success of our program has been demonstrated in many other ways. Observers at the school site have noted the high quality of individual and group science-related projects, the environmentally-oriented writing done by the students, the enthusiasm, and high level of school attendance.

Student achievement in the Comprehensive Test of Basic Skills (CTBS), California Assessment Program (CAP), and District proficiency tests tends to be among the highest in the district. The staff believes that the quality of the science program is reflected not only in student enthusiasm, but in the achievement in basic skills.

For several years, Kimbark has provided observational opportunities for preservice teachers from California State University, San Bernardino. Environmental education lessons demonstrated by Kimbark's teachers have proved models that these preservice teachers could follow in developing their own lessons.

HEALTHY ENVIRONMENT--HEALTHY ME: A SCHOOL CURRICULUM FOR KINDERGARTEN THROUGH SEVENTH GRADE

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Introduction

Healthy Environment--Healthy Me is an interdisciplinary, supplementary environmental and occupational health curriculum. As an "environmental health promotion" curriculum, it is designed to provide young people with the knowledge and understanding for creating a safe and healthful environment at home, in their workplace and in their communities. The primary audience is school children in kindergarten through seventh grade. Lesson plans and activities can also be used in pre-school, after-school and summer programs, as well as by community groups interested in providing exciting educational activities for young people.

Environmental health can be described as the study of environmental conditions in relation to human health and well-being. The activities in Healthy Environment--Healthy Me enable students to study their environment by examining how they affect it, and how the environment affects them. Of prime importance throughout the curriculum is the basic assumption that people can and must take greater responsibility for making decisions about their own health and the health of their communities.

Environmental hazards are "scary" by nature, therefore care has been taken, particularly in the primary grades to create a healthy degree of concern for environmental and occupational health, without contributing to the level of fear.

Healthy Environment--Healthy Me is being developed by the Public Education and Risk Communication Division of the Environmental and Occupational Health Sciences Institute (EOHSI), which is jointly administered by Rutgers, the State University of New Jersey, and the University of Medicine and Dentistry of New Jersey (UMDNJ)--Robert Wood Johnson Medical School. The Public Education and Risk Communication Division is designed to meet the public's need for accurate and reliable information about environmental and occupational health risks.

Organization of Grade Levels

"Healthy Environment--Healthy Me" is organized into grade level units. Each unit can be used in its entirety as a unit on environmental and occupational health or individual activities can be selected for inclusion in existing programs or courses. The curriculum is designed to be easily integrated into various subject areas, especially health, science, and social studies. An overview of each grade level follows.

K--My Environment and Me

This unit defines the environment including: the indoor and outdoor environment, natural objects and objects made by people, and living and nonliving elements. Students have the opportunity to learn about the various factors that make up the environment and how these factors are interdependent. Upon completion of the unit students will be able to explain why clean water, air and soil are important for people to stay healthy. In addition, the children have an opportunity to demonstrate the importance of taking responsibility for keeping the environment clean and healthy by doing an "Environmental Cleanup".

1--Recycling: A Community Pollution Solution

This unit explains the importance of a CLEAN environment and generally describes the health consequences of living in a polluted environment. The unit concentrates on people taking responsibility for keeping the environment clean. The children identify littering as one type of pollution and have the opportunity to do a "Litter Walk" to take action against this type of pollution. The children learn about the problems of garbage disposal/solid waste management with recycling as one positive community solution to this growing problem. Upon completion of the unit the children will be able to: list ways that people can prevent the environment from becoming polluted, define reuse, describe where the garbage goes and demonstrate how to recycle aluminum, glass and newspaper. A "Recycling Project at School and at Home" is part of this unit.

2--Creating a Safe Environment

In this unit the meaning of safety and hazard are explored. Children search out safe situations and hazardous situations in their school and at home and then conduct a "Safety-Proofing Project". The unit explores in depth two safety issues; noise pollution and hazardous household products. Upon completion of the unit students will be able to: define protection; describe why noise can be a hazardous; list ways to prevent noise pollution and; describe work and play situations where people need to protect their hearing. Students will also be able to: explain that children should never touch, taste, or smell things that they don't know without first asking an adult; identify potentially hazardous products by recognizing "warning words" on the label; explain that hazardous products have important uses; and demonstrate proper storage of potentially hazardous products. Along with demonstrating steps for creating a safe environment at school and at home, the children learn to "Handle Emergencies with Confidence" by acting out how to handle emergencies and practicing emergency telephone calls.

3--My World Affects My Body

This unit concentrates on how various factors in the environment affect different systems in the body including the: muscular, circulatory, respiratory, skeletal, digestive and nervous systems.

Upon completion of the unit the children will be able to describe the requirements for each body system, list environmental factors that impact on each system in positive and negative ways, and explain generally the health effects of pollution on the body. The children will use their problem solving skills to identify an environmental problem involving a threat to their health, suggest solutions, carry out one solution, and analyze the results.

4--Outside, Inside-Our World In Our Bodies

This unit explores people's impact on the environment in both good (healthful) and bad (unhealthful) ways and, in turn, the resulting environmental impact on human health. The focus in this unit is on environmental interdependence. Upon completion of this unit the children will be able to: described ecological cycles, explain how a pollutant or environmental hazard travels through the environment (focusing on water as a medium), describe how a pollutant or environmental hazard enters the human body (focusing on the digestive system), explain the concept of environmental risk, and describe the possible impacts of a proposed solution to an environmental problem. The children will actually trace an environmental hazard through the environment, following it as it enters the human body. The class will then have the opportunity to explore possible positive solutions.

5--Clean Air-Healthy Lungs

This unit introduces concepts of occupational health and safety, focusing on air quality and the respiratory system. The overall goal of the unit is to assist students in making responsible choices about their own health and safety when they join the work force. Upon completion of the unit the children will be able to: describe the defense mechanisms in the respiratory system, identify some potential lung hazards in the environment and workplace and describe their effects on the respiratory system, explain the concept of environmental and occupational health risks, explain the importance of protecting people from respiratory hazards, describe ways of protecting people from respiratory hazards, and generally describe the importance and purpose of Right to Know Legislation and the OSHA Hazard Communication Standard. Students will research and report on an occupational lung disease including causes, types of workers affected, symptoms, treatment, and prevention/protection strategies. The class will also look at the responsibility of the worker, the employer and the government.

6--Healthy Communities-Healthy People

This unit investigates land use issues and the impact on people's health. Upon completion of this unit the students will be able to: describe a variety of ways that land is used within their communities, explain the concept of urban planning and land use, identify environmental pressures placed on the land, explain the basic concept of benefits vs. environmental risks, relate land use patterns to health benefits and health risks, describe the general importance and purpose of Community Right To Know Legislation, discuss the importance of waste management policies and practices (particularly waste water, solid waste and hazardous waste). Students will conduct a research project investigating a land use problem in the community and proposing solutions.

7--Choosing A Healthy Environment

This unit focuses on individual and community choices or decisions that impact the environment and public health. Upon completion of this unit students will be able to: define the concept of public health; explain the concept of benefit versus environmental risk; describe decisions that individuals can make to create a more healthful environment at home, in the community and at work; describe strategies that have been used to solve an environmental health problem; illustrate how the OSHA Hazard Communication Standard and Right To Know Laws can be used to protect and improve environmental and occupational health; demonstrate ways that government, industry and individuals can work together to protect environmental health; evaluate the effects of protective laws and community efforts designed to protect the environment and public health. Students will develop criteria for building a community where environmental and occupational health are the primary concerns.

HOW TO PLAN A CONTROVERSIAL ISSUES PROGRAM: THE KNOW NUKES EXAMPLE

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As the environmental education profession continues to mature, it must seriously question its impact and its audience. By confronting difficult and controversial public issues and by working with diverse interest groups, environmental educators are more likely to forge the political coalitions that are necessary to expand their educational and political impact. This article summarizes guidelines that will be useful for educators who wish to plan programs that encourage controversy and diverse participation.

The KNOW NUKES Institute (1982-1987) was created to help science and social studies teachers introduce the nuclear power controversy in their classrooms. The project directors wanted to engage teachers in an education process that would fully engage them in the most difficult dimensions of the nuclear power debate. Similarly they wished to forge educational coalitions between the typically antagonistic advocacy groups.

Assumptions

During the planning stages of the Institute, the staff made several important educational assumptions:

Nuclear power education must emphasize the controversies involved. Most nuclear power education, especially in the region served by the project (New England) was primarily advocacy education. Public utilities and citizen advocacy groups had developed education programs that were mainly useful for individuals or groups that had already made their mind up on the subject. KNOW NUKES would be distinguished by its ability to incorporate the diverse perspectives. If the KNOW NUKES program was heterogeneously endorsed, it would contribute to nuclear power education. But this endorsement would have to reflect true support, rather than a perfunctory acknowledgment of a balanced program.

Controversial issues education (CIE) is most effective when it has diverse participation and involves the university, the public school, private industry, and community groups. Issues education frequently includes diverse membership, but for KNOW NUKES it was essential that representatives from these groups actually plan the program. This would accomplish several objectives. It would allow those groups to better understand their perspectives and allow them to overcome their stereotypes of each other. It would insure that the teacher training program would have the fullest access to the resources of both groups. It would provide a model for other institutions, demonstrating the viability of the controversial issues approach and reaffirming the plausibility of heterogeneous involvement in educational program planning.

Education programs are highly stimulating when a cognitive disequilibrium exists. A cognitive disequilibrium occurs when individuals are confronted with diverse interpretations of similar data. It causes the individual to rethink previously held assumptions. Our hope was that the planning group, despite the strength of any individual's convictions would constantly have their fundamental assumptions challenged. This would occur over a long term basis in which frequent exposure to alternative perspectives would demand fresh attention be given to any issue. In a sense, the planning group would model the teacher training process which it would implement. In considering how to set up the program, which speakers to get, what exercises to choose, etc. the planning group would experience the same cognitive disequilibrium that would occur for the teachers.

4) A successful planning process would result in excellent promotion of the project. It was essential that the program have the full philosophical support of the planning group. If that were the case, the group would serve as excellent representatives of the project idea within their particular constituencies. The utility representatives would publicize and support the project among other utility educators; citizens advocates would work within their network, etc.

Creating the Educational Environment

The fundamental conceptual foundation of these assumptions is the importance of developing an appropriate community of controversy, a learning environment that allows diverse interests to openly express their points of view, without jeopardizing the educational goals of the project. This process solicits the participation of those individuals and interest groups that are key actors in the discourse surrounding a controversial issues. Community implies that the participants establish communication rules enabling them to openly express themselves and to be willing to consider multiple and varying perspectives.

The following tensions must be balanced while creating this educational environment:

Strange Bedfellows. The most obvious and difficult first step is to chose the size and members of the planning groups. For the KNOW NUKES project, the project directors desired to keep the group small enough that it could develop some intimacy and actually plan an education program. But the group also had to be large enough so that one individual could not dominate the group or single-handedly reinforce a stereotype. The final decision was to have two utility representatives, two citizen advocates, two Antioch/New England faculty members (the project directors) and one public school science teacher.

Planning Group Communication. The primary group communication objective was to allow for an open discussion atmosphere. Group members needed the ability to state whatever was on their mind without any sense of retribution from other members. Rather, in the interest of "cognitive perspective taking" individuals should develop an empathy for the opposing perspective. When disagreements occurred individuals were urged to disagree with the idea rather than with the personality of the individual.

The most difficult facilitation problem was to allow creative conflict to emerge without the advocacy agenda overwhelming the purpose of the meeting. If the participants are always on their best behavior, one risks the inevitable "seething underneath" or the absence of the interesting ideas that often develop from conflict situations. On the other hand, the purpose of the meetings was not to debate the virtues of nuclear power, but to plan an educational program that would allow teachers to consider the relative merits of nuclear power.

Credibility and Morality. The KNOW NUKES experience allowed us to extrapolate several observations about establishing credibility. Most importantly, the director must be completely honest about his/her view on any issue that arises. Although one risks alienating the individuals who have a different point of view than the project director, if he/she does not reveal his/her stand, the hidden advocacy agenda will ultimately interfere with effective leadership. The groups participants would always be wondering about the advocacy motivation of the leader.

For example, during the KNOW NUKES planning process, the project directors revealed their perspective on nuclear power at the first meeting. They also emphasized that their primary commitment was to the virtues of controversial issues education and not to their advocacy position, yet they recognized that implicitly their advocacy agenda could emerge. They strongly urged the group to flag such a situation.

Decision-Making and Accountability. Ideally, a CIE planning group will take significant responsibility for determining the educational program. This not only improves the actual program content but it invests the planning group in the outcome of the project. Two types of dilemmas could conceivably arise. The project director must overcome any tendency to take too much control of a program but also must be willing to exercise appropriate leadership. There might be some circumstances when a consensus is not administratively possible, in which case, the project director must take an important decision for the project.

Balance or Controversy. It is essential that a controversial issues project be perceived by the planning group, project participants, and the outside world as balanced. What exactly does balance mean? We refer to balance as the representative availability and strength of contrasting perspectives. Each member of the planning group must believe that the project has selected the most effective speakers for the education program. Balance is not a middle-of-the-road approach which squelches controversy and passion. This is not necessarily immediately grasped by a planning group. In some cases, such as the presentation of what is perceived as technical information, i.e., how a nuclear power plant generates electricity, it is helpful to have a speaker who is perceived as neutral. Balance does not require that every exercise or written material developed by a project represent contrasting perspectives. Rather it is the sum total of project activities that is evaluated. The death knell for the credibility of a CIE program is a perceived lack of balance.

The controversial issues approach to environmental education has great potential. It allows individuals with extremely different value systems to better understand the sources of their conflict and tension. It breaks down the unfortunate stereotypes that are often created in conflict situations. Most importantly, it lends credibility to your perspective among those groups who are least likely to find you legitimate. When you confront difficult controversial issues, you not only effectively communicate your point of view, but you get an opportunity to see how you're perceived by others. It is clearly worth the effort.

NOTE: This is an abridged version of a lengthier paper that is available from the author.

LEARNING FROM NATURE: DISCOVERING PARALLELS

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When working with youth in environmental education programs, it becomes apparent that attitudes are obviously effecting motivation and behavior concerning environmental issues. While visiting with teachers and naturalists, they suggested that many of their students trusted no one and felt they had to be self-sufficient. From this setting came the idea of teaching concepts of nature, which had the potential of paralleling personal or social issues.

From this, we have developed Environmental Education materials to use with small groups of all ages. These materials are:

--Action oriented,

--Consistent with sound learning theories,

--Cognitive in design, and

--Based on scientific facts about natural laws and concepts which parallel personal or social issues.

We call these materials The Learning from Nature Series: Discovering Parallels. The series is designed to teach young people about nature and about people, by looking at analogous situations in two settings. The order, laws and processes of nature provide an environment which can help young people better understand themselves, their values and their relationship to other people.

The leader's guide describes a method of presentation, learning activities and discussion questions. Although a knowledge of natural science is helpful, it is not essential for the leader to have this background to teach this series.

Each of the concepts is presented in a similar fashion. There are three parts to each lesson: 1) the Concept in Nature, 2) the Concept in Human Society and 3) a Comparison of the Concept in the Two Societies. For 1) and 2), a "Leader's Introduction" contains a brief description of the concept. The leader should be familiar with the script and be able to tell it in his/her own words. The learning activities, Observation (learning activities A and C) is the first activity, looking and describing something in nature or recalling a past observation of a human social situation. In activities B and D, the participants are then asked to Speculate on the explanation and consequences of the phenomenon they observed. The leader's page tells how to conduct the activity using the task sheets that follow. The only equipment needed for each student is a pencil and paper (or the leader may wish to duplicate the task sheets for each participant). A sample of one of the Parallels: Ecological Dominance follows.

The page titled "Leader Wrap-Up" helps the group define the concept according to what they have observed, compare the concept in the two communities and then consider suggestions for future activities.

SAMPLE

Leader's Introduction

Leader 1-a, Leader 1-b
Concept 1: Ecological Dominance
Setting: Meadow or Forest

Provide Basic Concept

Learning Activity 1-a, Observe, 15 minutes

Point out some examples of plant (or animal) dominance in the setting you have selected. Decide on the physical limits of an observation area and instruct participants to select an area of that size (20'X20'). Show the task sheet 1-a and tell them to draw the chart on paper. The students may work individually, in pairs or in small groups to observe and record their observations. Allow about 15 minutes for this activity.

This activity will help participants identify the dominant species of plants and animals, describe the growing conditions for each organism and note how species' dominance has affected the growth of other plants or animals in the area.

Learning Activity 1-b, Speculate

Call the group together and ask them to write down the questions on task card 1-b. Divide into small discussion groups, appoint a discussion leader for each group and ask them to discuss the questions.

This activity will encourage participants to speculate on how and why dominance has occurred for each organism.

Re-assemble the group and ask them to share their ideas on dominance: What are the various characteristics which make plants or animals dominant? Use this as a lead-in to dominance in the human realm.

Leaders Introduction

Leader 1-c, 1-d
Concept 1: Ecological Dominance
Setting: Human Realm

Provide Basic Concept

Learning Activity 1-c, Observe, 10 minutes

The members of your group have been observers of the human scene all their lives. Your job is to help them interpret what they have witnessed. Ask them to make a chart like the one shown in Task 1-c. Point out to them the similarity of this task with 1-a.

Participants will list the ways individuals influence a community, describe the traits which make a person dominant and consider the effects of one person's dominance on others.

Learning Activity 1-d, Speculate

Call the group together and explain a personality profile to them. Working individually or in small groups, instruct each group or person to prepare a profile of the person with the most influence in their community. Show task sheet 1-d.

Re-assemble as a large group and share profiles. Lead a discussion on how and why certain people are dominant. The following questions may stimulate discussion: "You have identified many situations in which one person may dominate others and many reasons for why they are able to do this. Which personality trait has the greatest effect on dominance? The least? Are there limits to dominance? Restrictions? What could change one person's ability to be dominant?"

Although there is no single theory that accounts for the learning process, the Parallel series is consistent with several canons of learning. For example, the brain is not passive; it does not await stimuli to which to respond. It is aggressively active and continually seeks out what it needs to make sense of the surrounding reality. What the brain seeks and how it processes what it receives depends predominantly on what is already stored in the brain. All learning is based on past learning. Parallels guide the learner to explore the uncommon from a shared perspective.

Many neuroscientists have suggested that programs are arranged in a hierarchy of levels. All though (creative, analytical or whatever) proceeds through level upon level of programs. "As the aggressive brain attacks the environment, the entire perceptual apparatus concentrates on what is recognizable, or almost recognizable, via binary codes, to existing prosters, and usually brushes aside the rest as meaningless to this brain" (Hart, 1975:109). In other words, an individual cannot perceive that which he has not experienced or purposed to receive. You "see" what you need to see, what is useful for making sense of your world. Parallels guide the learner from the known to the speculative, or less known.

Behavior is goal directed. According to Proster Theory, learning is the acquisition of useful programs (Hart, 1978:395) and the process of learning is the extraction of meaningful patterns from confusion. What is called insight is most likely the recognition of the pattern that solves a problem. The brain does not have to be taught to distinguish patterns, pattern distinction is what it does best. The mind possesses an innate order-generating capacity, a built-in drive to learn. Parallels guide the learner toward a recognition of interrelationships between their physical and social environment. By studying the benefits in nature as observed in motivation, the participant can readily recognize the values associated with efforts in our society to work together to bring about mutual benefits.

Attitudes and values are certainly part of the "whole person" and are intimately involved in any decision made to solve problems effecting people or the environment. Many environmental educators agree that a study of values is basic to Environmental Education, but there is no agreement on the approach to use. Every problem has a moral component and people must be able to recognize that component and deal with it as part of the decision-making process. Parallels may be used as a value clarification instrument that examines personal value sets in a non-threatening manner.

Environmental education and interpretation have always stressed first-hand experiences, real objects, a "one world" approach to learning. The real world is a unity, not a series of separate, unrelated disciplines, which is why environmental educators have insisted on a multidisciplinary/ interdisciplinary approach to education. No one subject is more "environmental" than the other. A problem-oriented approach, rather than a subject-matter approach, is more reflective of the world as it really is. Parallels is experiential!

The ultimate protection for our natural and cultural environment in a democratic society is the knowledge level and values of its people. As environmental educators, we have to constantly search for ways to improve our effectiveness. One way to improve is to understand the way in which people learn and to design learning experiences based on sound learning theories.

For additional information or copies of other parallel concepts contact the authors.

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PROJECT MAYFLY: WATER QUALITY MONITORING FOR SECONDARY SCHOOLS

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Project Mayfly was started in 1975 when a local environmental commissioner approached the high school science teacher and asked for assistance in gathering baseline data on the water quality of surface waters in the township. A bargain was struck in which the environmental commission supplied test kits and chemicals in return for the results of student water tests. The program was an immediate success:

--The students' enthusiasm was unbounded--possibly because they were involved in real local problems and making a contribution to the solutions of those problems.

--The program was very low cost to the school, yet received a lot of positive publicity.

--The commission received reams of baseline data on all streams within the township and were able to find the sources of pollution so that the health officer could pursue legal remedies.

--The program spread so that two local watershed associations, a local chapter of the National Audubon Society and of the League of Women Voters were also supporting the research in return for a report on the health of the waterways.

In the summer of 1983, the program was written up as Project Mayfly on a grant from the National Audubon Society. The MidAtlantic Regional Office of the National Audubon Society is reproducing the handbook at cost for distribution to interested youth leaders and teachers.

The purpose of Project Mayfly is to provide educational study units which will allow high school students to monitor the health of streams, rivers, and lakes in their own area. Written for teachers, youth group leaders and other interested adults, the Project Mayfly Handbook provides methods for chemical, biological and physical investigations of the water. The individual activities can be selected and redesigned for their content and/or skills and be used singly or in conjunction with other activities.

The background information for the teacher makes it a simple matter to insert the individual activities into the standard science curriculum. The project is divided into units which can be used separately or together. The units explain how to determine water quality chemically, by macroinvertebrates, by analysis of algae populations, by analysis of plankton, and by bacterial analysis. There are also units on planning a field trip to collect data and on stream walking.

The students become involved with the research process and with their local government as they use their skills to do original research on local problems. Because they know the results of their efforts are going to a local group, the students are more careful in carrying out their research. The students learn not only how to gather, write-up, table, graph and interpret their own data, but also how to use the research results to effect a change.

The advantages of a program like this are manyfold:

--One teacher can include any part of the program which fits the school curriculum. The curricular study is focused on applying the classroom study to finding pollution in local waterways.

--The cost to the school or youth group is low. The activity itself may cost nothing (such as stream walking or sampling for macroinvertebrates) or local groups can buy the equipment for classroom use.

--A liaison between local environmental groups and the class is of great benefit to both. Students get involved in the issues and the local groups get data they could not otherwise afford.

--Real changes are made in the environment as a result of the studies.

--When the students realize their research is going to be used to bring about significant changes, their attitude toward learning and gathering data becomes very positive.

Fourteen years of working with eleventh and twelfth graders on water quality monitoring have shown me that high school students are ready, willing, and able to do high quality valid research and are eager to bring about significant changes in their local environment.

THE USE OF ENVIRONMENTAL EDUCATION BY MAJOR ENVIRONMENTAL AND CONSERVATION ORGANIZATIONS

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This paper presents the results of a survey conducted in 1984/5 as part of a study of major environmental and conservation organizations. The full report of the study "An Examination of the Use of Environmental Education by Major Environmental and Conservation Organizations" includes sections on the groups' goals and objectives (gathered from constituting documents and publications) and the periodicals they distribute.

The survey was conducted with a questionnaire mailed to nineteen groups, thirteen responded. The thirteen were: The American Forestry Association (AF), The Cousteau Society (CS), Ducks Unlimited (DU), Earth First! (EF), Environmental Action (EA), Friends of the Earth (FE), Greenpeace U.S.A. (GP), The Natural Resources Defense Council (NR), the National Wildlife Federation (NW), Save-the-Redwoods League (SR), the Sierra Club (SC), Trout Unlimited (TU), and the Wilderness Society (WS). Those not responding were Environmental Defense Fund, Izaak Walton League of America, National Audubon Society, World Wildlife Fund, The Nature Conservancy, and Defenders of Wildlife.

The questionnaire gathered information falling roughly into three areas: finances, methods of communication, and issues and topics of concern.

Organizations Surveyed

Organizations were selected from over 600 listed under the categories 'conservation' and 'environmental' organizations in the Encyclopedia of Associations (Gruber Ed. 1984). Small organizations with narrow or specific areas of interest (such as a particular habitat or species) were eliminated immediately. A smaller group of organizations concerned about particular issues were mostly eliminated from consideration as well. DU, TU, AF, and SR are from this second grouping.

The largest groups have the broadest range of interests. Attempts were made to survey all organizations with a membership of 25,000 or more. However, some smaller groups were included. EF was included (5,000 subscribers) because it is a well known radical voice in the environmental movement. SR (with a somewhat local issue base) was included because it is an older group which has succeeded in pressing for state and national response to an issue of wide interest.

The Questionnaire

The questionnaire (appendix A) included items intended to gather information in three areas: 1) finances, including three sub-areas--sources of income (item 2), amount of income spend on education (items 3 and 7), and the audience to which the effort is directed (item 7); 2) methods, including five sub-areas--the relative importance of different media (item 8), the use of teachers (items 4,5,6,9,10, and 11), the use of lobbyists (item 11), and the importance of member activism (item 11); and 3) issues, including two sub-areas--subject area definition (items 12 and 13), and importance of various environmental issues (item 14).

The result revealed some problems in the construction of the questionnaire. The questions dealing with sources of funding might have been more valuable if the value 0% had been available as a response. The responses to items 4,5,6,9, and 10 indicated that they were not clearly understood by all the respondents. Items 9 and 10, intended to determine the portion of the staff involved in education, staff characteristics, and the role of teachers in education efforts, are not discussed in this paper.

The items which have yielded the most important information are those which revealed attitudes toward environmental issues and the amount of the educational budget devoted to reaching various audiences.

The questionnaire included a request for a copy of each organization's constituting document and a copy of a recent annual report. In some cases where constituting documents were not sent or do not exist, publications were examined to determine goals implicit in them. These results are not included in this paper.

Information From The Questionnaire

Many responses revealed similarities in methods and purposes of the education programs in use by the organizations surveyed. However, some of the groups responses were far from the norm in a few respects. Similarities can be seen by examining the results of the survey presented in appendix B. Some of the notable differences described below will be better understood after examining the complete list of responses.

Question 2, Funding sources. Membership fees and donations were the predominant high rated sources. Average amount of budget from membership fees was 45% and donations 35.5%. Nine respondents rated membership fees and donations between 21 and 60% of income, EF, FE and GP rated merchandise sales as important sources as well. CS, DU, and EF rated membership at 61-80% (EF relabeled the area as subscriptions). CS, EF and NW rated donations at 0-20%.

Question 3, Environmental education budget share. Considerable variation in level is revealed by this item. DU and NR rated the share at below 21%. CS and NW rated the share at 80-100%, EF at 61-80%.

Questions 4, 5, and 6, Education employees. Responses are fairly direct with the values of some suggesting a misreading of the items (e.g. NW with 80% of its budget in education but with no education staff)

Question 7, Groups targeted. A wide variety of responses was obtained for this area. However, all of those responding included the general public as having educational efforts directed at it. The two top average ratings were for general public--22.5%, and organization members--22.1%. EF, EA and FE rated member education highly at 41-60%. The third and fourth highest averages for targeted groups were elected officials, 16.8%, and government agencies, 16.1% An exception is WS giving a rating of 61-80% for the category "other" which it labeled "media."

Question 8, Methods. Ratings on a scale of 0-7 with 7 indicating the greatest importance. Magazines were rated by all of the respondents and received the highest average rating, 5.7. Seven organizations rated them at 6 or above; none rated them below 4.

The average rating of direct mail was relatively high at 4.0, but it was not rated as uniformly as magazines. EF rated it 0 while GP, NW, SR and WS rated it at 6. Pamphlets' average rating was high at 3.8 and was more uniformly rated.

All other methods received average ratings between 3.1 and 1.7, however, there are some important outliers. Seven out of ten respondents rated radio spots at 2 or lower but, DU and EA rated them at 5. Nine out of eleven rated slide/tape shows at 3 or lower but, CS and NW rated them at 6 and 5 respectively. Nine out of twelve rated teacher guides at 0 or 1 while CS and NW rated them at 6 and SR at 4.

Several organizations added methods on the blank lines provided: CS added "testifying/articles" at 6, EF added "road show" at 5, GP added "print/broadcast news coverage" at 6, NR added "seminars in environmental law" and "hiring of environmental interns" at 4, and WS added "press and media kits" at 5.

Question 11, Lobbyists/member activism. (0-7 scale as above) GP, NR, NW, SC, WS, EA, and FE rated federal lobbyists at 5, 6 or 7. CS, DU and EF rated them at 0 or 1. Tax free status likely controls these ratings. Ratings of state lobbyists were spread evenly from 0 to 5. However, EA rated them at 7. The average rating of member activism was 5.2 with CS, DU, EA, GP and WS rating it as 6 or 7.

Question 12, Conservation-preservation. (0-7 scale as above) The average rating of ecosystems was the highest at 5.6. The average for habitat was 4.6 but with a wider range of values. Flora and fauna were rated consistently lower at 3.6 and 3.7 respectively. AF and DU, organizations with narrow concerns, gave interesting ratings. AF rated fauna at 2 and DU rated flora at 2. Other interesting ratings were as follows: EA rated ecosystems at 7 and all others at 0, FE rated all but flora (at 1) with average ratings, GP rated habitat at 2 and ecosystems at 6, SC rated flora and fauna at 1, ecosystems at 2 and habitat at 3.

Question 14, Importance of issues. (0-7 scale as above) The averages of the rankings produce a fairly straight line from highest to lowest. The issues in order of their average ranking are:

Habitat loss (5.2); endangered species, toxic/nuclear waste, and wetlands protection (4.8); federal land use (4.6); ground water quality (4.5); air quality (4.2); inland water quality (4.1); desertification (4.0); ocean water quality and world population growth (3.8); energy generation and use (3.7).

Two issues received ratings which were bunched at two points on the scale. Energy generation and use was rated between 4 and 7 by eight of the respondents while DU, EF and WS rated it at 1 and SR rated it at 2. Inland water quality was rated at 1 by EF and WS, 3 to 5 by eight others, and 7 by DU, NW and TU.

Thirteen additional issues were added by respondents on blank lines provided. Those responses are included at the end of appendix B.

AF, FE, SR and SC kept their ratings grouped quite closely while CS, DU, EF, TU and WS gave ratings in a low and a high grouping. EA, GP and NR used a wide range of ratings while NW gave all rated issues 7.

Appendix A

This section includes all of the items from the questionnaire, condensed.

1. If your organization is part of another group or agency or was established by another, please describe that relationship.

2. Please check the approximate percentage of your funding supplied by the following sources: A) user fees; B) local government funding; C) state funding; D) federal funding; E) membership fees; F) donations; G) other. (responses available were: 0-20%, 21-40%, 41-60%, 61-80%, 81-100%.

3. What percentage of your budget is spent providing environmental education? (responses available were: 0-20%, 21-40%, 41-60%, 61-80%, 81-100%).

4. How many of your organization´s employees (full time equivalents) spend more than half of their time in education related tasks?

5. How many volunteers (full time equivalents) work at education related tasks?

6. Of your employees with mostly educational responsibilities: A) How many are high school graduates or have less education? B) How many have two year degrees only? C) How many have four year degrees only? D) How many have graduate degrees?

7. Indicate the amount of your resources used specifically for the education of these groups: A) your organization; B) the general public; C) a special interest group; D) school groups; E) elected officials; F) government agencies; G) industry leaders; H) other. (responses available were: 0-20%, 21-40%, 41-60%, 61-80%, 81-100%).

8. Rate the following according to their importance in your education outreach. Add others if necessary. (0=of no importance, 7=used exclusively) A) books; B) direct mail; C) films and videotapes; D) magazines; E) pamphlets; F) posters; G) radio shows; H) radio spots; I) slide/tape shows; J) teacher guides; K) television shows.

Responses for all the following items were recorded by marking a number line which appeared like this: 0-1-2-3-4-5-6-7.

9. Rate the importance of the following educational methods where teachers are directly involved with learners. (0=of no importance, 7=used exclusively) A) in informal groups or encounters: 1) at a museum or teaching center; 2) in the field; 3) at a school; 4) at another organization's meeting; 5) elsewhere. B) in regularly scheduled classes: 1) at a museum or teaching center; 2) in the field; 3) elsewhere.

10. Rate the importance of the following situations where education materials might be used without teachers being present. (0=of no importance, 7=used exclusively). A) at a museum or teaching center; B) in the field; C) other.

11. Rate the importance of these other methods to your educational efforts. (0=of no importance, 7=used exclusively) A) lobbyists, federal; B) lobbyists, state; C) member activism.

12. Rate the following according to their importance in establishing your education objectives. (0=of no importance, 7=of greatest importance) A) preservation of resources; B) conservation of resources.

13. Rate the following areas according to the amount of education effort directed primarily toward them. (0=of no importance, 7=of greatest importance) A) increasing knowledge about habitat; B) increasing knowledge about flora; C) increasing knowledge about fauna; D) increasing knowledge about ecosystems.

14. Rate the importance your organization assigns to changing people's attitudes about the following issues. Some issues that you feel are important may not appear. Please, include them in the blank spaces. (0=of no importance, 7=of greatest importance) A) air quality; B) desertification; C) endangered species; D) energy generation and use; E) federal land use; F) ground water quality; G) habitat loss; H) inland water quality; I) ocean water quality; J) world population growth; K) toxic/nuclear waste; L) wetlands protection. Three blank spaces were supplied for additional answers.

This table shows the results of the questionnaire, including those areas not discussed in the text. Lower case letters refer to comments written on the questionnaire by respondents. They appear at the end of the table. Upper case letters represent the ranges of percentages given as choices on the questionnaire: A = 0-20%, B = 21-40%, C = 41-60%, D = 61-80% and E = 81-100%.

	ORGANIZATIONS														
QUESTIONNAIRE ITEM	AF	CS	DU	EF	EA	FE	GP	NR	NW	SR	SC	TU	WS	x	s
1. PART OF ANOTHER GROUP?	-	-	-	-	-	-	-	-	-	-	-	-	-		
2. FUNDING															
USER FEE	-	-	A	-	A	A	A	-	A	-	A	-	-	10	0
LOCAL GOVERNMENT	-	-	A	-	A	A	A	-	A	-	-	-	-	10	0
FEDERAL	-	-	A	-	A	A	A	-	A	B	A	-	-	12.9	7.7
STATE	-	-	A	-	A	A	A	-	A	B	A	-	-	12.9	7.7
MEMBERSHIP FEES	C	D	D	Da	C	C	C	B	C	B	B	C	B	45	12
DONATIONS	B	A	B	A	C	B	B	C	A	C	B	C	C		
OTHER	A	A	A	Bb	A	Ac	Ad	A	B	-	B	-	-	16.8	10.2
3. EDUCATION BUDGET	C	E	A	D	C	C	C	A	E	B	B	B	B	45.8	26.1
4. EDUCATION STAFF	10	25	3	1	8	13	40	-	-	2	28	3	8		
5. EDUCATION VOLUNTEERS	1	2	0	e	-	5	25	-	-	-	f	-	-		
6. EDUCATOR TRAINING															
HIGH SCHOOL OR LESS	3	-	-	2	-	4	-	-	-	-	-	1	-		
ASSOCIATE	-	-	1	-	-	1	-	-	-	1	-	-	1		
BACHELOR	5	12	2	1	14	9	28	-	-	1	20	2	5		
MASTERS/PHD	2	3	-	1	3	3	8	-	-	-	8	-	2		
7. RESOURCE ALLOCATION															
ORGANIZATION	C	A	A	A	C	C	A	-	-	-	A	A	A	22.1	19.1
PUBLIC	B	B	A	A	B	A	C	-	C	A	A	A	B	22.5	15.6
SPECIAL GROUP	-	A	A	-	-	A	A	-	-	-	A	-	A	10	0
SCHOOL GROUPS	-	A	A	-	-	A	A	-	C	A	A	-	A	15.1	14.3
ELECTED OFFICIALS	-	A	A	-	B	B	A	-	A	-	B	A	A	16.8	10.3
GOV. AGENCIES	B	A	A	-	A	B	A	-	A	-	B	A	A	16.1	9.9
INDUSTRY LEADERS	A	A	A	-	A	A	A	-	A	-	C	A	A	10	0
OTHER	-	-	A	-	-	-	[illegible]	-	-	-	C	-	Dg	43.3	30.5

	ORGANIZATIONS														
QUESTIONNAIRE ITEM	AF	CS	DU	EF	EA	FE	GP	NR	NW	SR	SC	TU	WS	x	s
8. METHODS															
BOOKS	1	4	2	2	4	3	2	4	5	4	5	2	3	3.1	1.5
DIRECT MAIL	1	3	5	0	4	4	6	4	6	6	4	3	6	4.0	1.9
FILM/VIDEO	1	-	5	3	2	2	6	-	4	0	3	2	1	2.4	1.8
MAGAZINES	6	5	7	6	7	6	5	4	6	-	4	6	1	5.7	1.0
PAMPHLETS	3	-	4	4	5	3	4	-	6	4	2	4	3	3.8	1.1
POSTERS	-	2	3	3	3	1	4	-	6	3	1	3	0	2.6	1.6
RADIO SHOWS	-	-	4	3	3	2	3	-	2	1	1	2	1	2.2	1.0
RADIO SPOTS	1	-	5	0	5	0	2	-	4	1	1	2	3	2.7	1.8
SLIDE/TAPE SHOWS	-	6	1	3	0	0	2	-	5	2	2	3	1	2.5	2.0
TEACHER GUIDES	1	6	1	0	0	0	1	-	6	4	1	0	0	1.7	2.3
TV SHOWS	-	6	5	2	2	2	4	-	1	2	1	2	1	2.5	2.3
TV SPOTS	-	-	6	0	2	0	4	-	4	2	1	2	3	2.4	1.9
BLANK LINE	-	h	-	i	-	-	j	-	-	-	-	-	k		
9. TEACHER INVOLVEMENT															
INFORMAL															
CENTER	-	-	2	-	0	0	1	-	4	3	3	0	-		
FIELD	-	5	4	-	71	0	1	-	4	-	3	4	-		
SCHOOL	-	6	5	-	3	2	2	-	4	3	2	1	-		
MEETINGS	-	-	4	-	4	2	2	-	1	1	2	3	-		
ELSEWHERE	-	6m	3	-	-	2	2	-	-	-	2	-	-		
CLASSES															
CENTER	-	-	1	-	0	0	1	-	6	3	3	0	-		
FIELD	-	-	2	-	3	0	1	-	6	-	4	0	-		
OTHER	-	-	1	-	-	2	1	-	-	-	2	0	-		
10. MATERIALS, NO TEACHER															
CENTER	-	-	4	-	4	2	1	-	3	3	3	0	-		
FIELD	4	5	6	-	4	1	4	-	3	3	2	4	-		
OTHER	4	-	2	-	-	3	1	-	-	-	1	-	-		
11. OTHER METHODS															
LOBBYISTS															
FEDERAL	4	1	1	1	7	5	5	5	5	0	5	3	6	3.7	2.3
STATE	2	1	1	0	7	2	4	4	5	0	3	3	-	2.7	2.1
MEMBER ACTIVISM	4	6	7	7	7	4	6	3	5	4	4	5	6	5.2	1.4

	ORGANIZATIONS														
QUESTIONNAIRE ITEM	AF	CS	DU	EF	EA	FE	GP	NR	NW	SR	SC	TU	WS	$\bar{x}$	s
12. PRESERVATION	1	7	7	7	7	6	3	-	4	7	6	3	7	5.4	2.1
CONSERVATION	6	7	7	0	7	2	6	-	4	-	5	6	7	5.2	2.3
13. SUBJECT AREAS															
HABITAT	4	6	7	5	0	6	2	-	7	5	3	6	4	4.6	2.1
FLORA	6	6	2	4	0	1	3	-	5	6	1	6	3	3.6	2.2
FAUNA	2	6	6	4	0	3	3	-	5	5	1	6	3	3.7	2.0
ECOSYSTEMS	5	7	5	7	7	5	6	-	7	6	2	6	4	5.6	1.5
14. IMPORTANT ISSUES															
AIR QUALITY	6	3	2	1	7	6	2	4	7	4	5	7	1	4.2	2.3
DESERTIFICATION	6	6	2	5	3	5	1	4	-	4	3	-	5	4.0	1.6
ENDANGERED SPECIES	6	6	4	6	1	5	6	4	7	4	3	6	5	4.8	1.6
ENERGY GEN/USE	4	5	1	1	7n	6	5	4	-	2	4	5	1	3.8	2.1
FEDERAL LAND USE	6	2	3	6	5	5	1	4	7	4	5	5	7	4.6	1.8
GROUND WATER QUAL.	7	3	4	1	7	4	6	4	7	2	5	7	1	4.5	2.3
HABITAT LOSS	5	6	7	6	2	6	4	3	7	4	5	7	5	5.1	1.6
INLAND WATER QUAL.	5	3	7	1	4	3	4	4	7	4	3	7	1	4.1	2.0
OCEAN WATER QUAL.	5	7	4	1	5	3	6	2	7	4	2	2	1	3.8	2.1
WORLD POP. GROWTH	6	6	3	4	2	6	3	2	7	4	4	2	1	3.8	1.9
TOXIC/NUKE WASTE	6	7	3	2	7o	6	6	6	7	2	4	5	1	4.8	2.1
WETLANDS PROTECTION	4	7	7	1	2	5	6	5	7	3	2	7	6	4.8	2.1
BLANK LINES	-	-	-	p	q	r	s	-	-	t	-	-	u		

NOTES FROM RESPONDENTS: a. Subscription fees; b. Sales of t-shirts, calenders, etc.; c. Merchandise sales etc; d. Merchandise sales, miscellaneous fundraisers; e. Several; f. Hundreds; g. Media; h. Testifying -- articles; i. Road show; j. Print/broadcast news coverage; k. Press and media kits; l. We give citizen workshops frequently; m. Expeditions; n. Real big; o. Real big; p. Natural diversity 7, Wilderness 6; q. Disarmament 7, Recycling 7; r. Nuclear energy 5, Nuclear weapons 6, Deforestation 5, Wild rivers 5, Sustainable agriculture 5, Antarctica 4, Consumer appetite growth 6; s. Nuclear weapons testing 6, Ocean ecology/ocean species conservation 6; t. Saving redwoods in parks; u. Wilderness designation 7

FINDING THE 'E' IN S/T/S

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A clearly emerging goal of science education today involves the interaction of science and technology and their combined effects upon society. A major goal cluster of Project Synthesis, one of the most comprehensive research synthesis efforts in science education in recent years, focuses on the role of science education in producing informed citizens prepared to deal with science-related social issues (Harms and Yager, 1981).

Those individuals associated with the environmental education movement of the past twenty years have also developed and stated goals. Though disagreement with definitions and terminology has existed throughout this period, most environmental educators would agree that environmental education is aimed at (among other things) producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (Stapp, et al. 1969).

It is the intention of this paper to look for some connections and possible contributions that environmental education can make to the implementation of the science-technology-society (S/T/S) goals of science education. This will involve the further description of both educational thrusts, comparisons of the work of individuals and organizations attempting to progress toward these goals, and an examination of the question of whether or not future attempts to implement science-technology-society science programs should include environmental education components.

The Science-Technology-Society Theme

The inclusion of an S/T/S approach to future science education programs has been identified and encouraged in the literature consistently for the past decade. The findings of Project Synthesis were an outgrowth of three major studies funded by the National Science Foundation during the late 1970's. The results of those studies were made available in 1977 and 1978 (Helgeson, et al. 1977; Weiss, 1978;

Stake and Easley, 1978). In reporting the findings of the research, Project Synthesis provides a model for future science education programs, and S/T/S is a major part of that model. It was also noted from the analysis of these reports, that most current school science programs do not approach the stated goal clusters of Project Synthesis. For example, it was found that:

--Nearly all science teachers (90%) emphasize goals for school science that are directed only toward preparing students for further formal study of science.

--Nearly all science teachers (99%) have a philosophical orientation only toward a specific discipline in science.

--Over 90% of all science teachers use a textbook 95% of the time; hence, the textbook becomes the course outline, the framework, the parameters for students experience, testing, and a world view of science. (Harms and Yager, 1981).

The National Science Teachers Association (NSTA) has recognized the trend to view science as a discipline concerned with the study of the interactions and impacts of science and society (NSTA, 1978). S/T/S, as a new conceptual model for science education, has become a suggested response to recent calls for educational reform (Hurd, 1984; NSTA, 1982; Bybee, 1985). It appears, then, that the S/T/S theme is a viable approach to new efforts in science education. Most studies show, however, that although many agree to it in principle, the actual implementation of S/T/S science programs is minimal (Yager, 1984).

Some Considerations of Environmental Education

The term "environmental education" means many things to many people, including those who refer to themselves as "environmental educators." The multiplicity of meanings is, at least in part, an outgrowth of the relative newness of the term (about 20 years), the nature of its origins, and the variance in the goals of its professionals. In fact, defining environmental education, particularly for the benefit of those who reside in one of the more established niches of the academic world, is considered by many to be a continuing dilemma (Disinger, 1983). The recognition that environmental education has evolved from roots in nature study, conservation education, and outdoor education has been addressed in the literature ever since the term environmental education began being used in the late 1960s (McInnis, 1972; Swan, 1975; Johnson, 1977; Hungerford, et al. 1983). The literature does show that, although a universally accepted definition does not exist, environmental education does have a substantive structure and framework, and what is important now is the implementation of its goals (Hungerford, et al. 1983).

For the purpose of this paper, let us describe environmental education as the interdisciplinary process of inquiry into both the specific and general environmental implications of human activities viewed from the perspective of social needs and values as they relate to the society (Bogan, 1973). To the extent environmental education does serve as a common thread joining nature study, conservation education, and outdoor education, the literature tends to show it has strong interconnections between science and technology and the issues and problems of society (Disinger, 1986). Environmental education is not limited to the study of natural environments; it necessarily includes human, or cultural environments. It may also be important to note that the common perception of environmental education includes the belief that environmental education tends to focus on the negative aspects of environmental issues. In this regard, environmental educators may be perceived as individuals dealing with what is wrong with science and technology's relationship to societal problems, rather than what is right (Disinger, 1986).

Demonstrating that environmental education can be a positive and proactive approach to finding solutions to environmental problems is a major challenge. The literature cites several factors which contribute to this challenge. Environmental issues seem to have an established position in the media; most citizens perceive the media as a reliable source for environmental information (Melton, 1976). In addition, many people believe that fundamental American cultural values and beliefs are at the cause of environmental problems (Bowman, 1977) but that there is a belief among a segment of the population that technology will solve environmental problems, sort of a "technology got us into these problems, and technology will get us out" attitude. That belief seems to decrease, however as the educational levels of those questioned increases (Melton, 1976; Silvernail, 1978; Donahue et al. 1974).

Connections: EE and S/T/S

When one begins to look at both the S/T/S approach to science education and the various programs in environmental education, one major connection tends to appear in the literature; that is, which societal problems are being dealt with?

In one study, 262 science educators from 21 countries were surveyed and asked to rank 12 global problems relating to science and technology. The top six in the rankings were: 1) World Hunger and Food Resources; 2) Population Growth; 3) Air Quality and Atmosphere; 4) Water Resources; 5) War Technology; and 6) Human Health and Disease (Bybee and Mau, 1986). All of these issues are "environmental" and have been addressed by environmental education for some time (Lisowski and Disinger, 1986). The respondents of the survey by Bybee and Mau also indicated that: 1) science and technology related global problems will be worse by the year 2000; 2) they, as science educators, were slightly to moderately knowledgeable about the problems; 3) it is important to study global problems in schools; 4) there is a clear trend toward S/T/S; 5) an integrated approach should be used to teach about global problems; and 6) there is public support for including global problems in school curricula.

The S/T/S focus group of Project Synthesis has identified major topics that are recommended for inclusion in S/T/S programs. These are: 1) energy; 2) population; 3) human engineering; 4) environmental quality; 5) utilization of natural resources; 6) national defense and space; 7) sociology of science; and 8) the effects of technological development (Harms and Yager, 1981). Again, these topics relate to environmental quality and environmental education.

The "Contemporary Issues in Science" Program offers secondary teachers a case study approach to examining eleven S/T/S related concerns (Staten Island Continuum of Education, 1982). The materials in the program include information and discussion questions about acid rain, radioactive wastes, hazardous wastes, Love Canal, and aquifers.

Modules are used in the "Preparation for Tomorrow's World" Program (Iozzi, 1982). Dilemmas are presented in which moral/ethical issues are addressed. Some of the modules deal with environmental change, technology and changing lifestyles, bioethics, and future scenarios in communication.

A middle school program "Connections: a Curriculum in Applied Technology for Fifth and Sixth Grades" (Melcher, 1982) includes lessons on topics such as recycling, solar energy, transportation, and nutrition. In New York, the State Department of Education is implementing "Science, Technology and Society, Block J" (1985) in which middle and junior high school students explore the interaction of science and technology with society through topics such as: What is in an aerosol spray? Who owns the sun? and What can we do about world hunger?

Should S/T/S become S/T/S/E?

The goals of science education currently include an emphasis on science and technology and their impacts on societal issues. Questions are now being addressed as how to best implement S/T/S science programs. The literature clearly indicates that S/T/S approaches to science teaching already address environmental issues. Since an S/T/S approach to science education programs has not yet substantively materialized, the current explorations into what S/T/S science programs should be and how they should work resemble the early stages of environmental education. So, couldn't the professionals of these two fields get together? At the very least the exercise could broaden the perspectives of both camps. Beyond that, there exists tremendous potential for science educators and environmental educators to advance the work of education in dealing with societal issues, and the goals of both fields could come closer to being implemented.

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THE INTEGRATION OF NON-PROFIT EDUCATION PROGRAMS WITH FORMAL SCHOOL CURRICULA--A TECHNIQUE

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This presentation dealt with the integration of education programs of two autonomous systems, that of formal schooling and that of an education non-profit center. A knowledge of the working similarities and differences of the two systems helps in identifying the common denominators between them. These common denominators, when placed into a display matrix, allow the program selectors of either system to chose what they perceive as valid in their own terms and needs. Since only the instructional content of the potential integrated program is important to the program selectors, knowledge of how the two systems administratively select goal oriented knowledge and content is not. Since instructional material cannot be developed without this information, a facilitator working within the strictures of both systems is required. Not only does the facilitator, in this case an environmental educator, act as a liaison but the facilitator also constantly updates and tailors the matrix to the specific needs of the program users. Timeliness is a vital factor in environmental education no matter who or what organizes the "environment of concern."

Differences between the two systems may be found in goal orientation and resource flow factors. Financial support and audience profiles are among the resource flow factors concerned. Formal school programs are developed from a system which deals only with education, operates within a structured and sequenced time frame within a controlled social and physical environment, covers any or all grades from kindergarten through twelfth grade, must answer to specified levels of proficiency and may be public or private. Non-profit education programs are developed from a system which is focused upon a specific interest in which education is only one aspect among others, audiences addressed are voluntary and may range from pre-school through adult at unspecified levels of academic experience or proficiency. Program sites and times dictate their own constraints and may be public or private.

Similarities between the two systems may be found in administrative process needs. In both systems, resource flow protection and social organizational level lead to a specialized goal identification and statement (Wintz, 1987). In both systems goal realization is expressed in terms of tangible objectives. Objective statements select and focus upon a content (data base and skills), a learner and some form of evaluative standard. Teaching techniques are not usually addressed in objective statements. A common matrix consisting of data base and/or skill experiences within the functional reach of a specified learner in the production of an evaluative instrument is a point of program integration.

Selection of instructional content considered appropriate to stated goals in both formal education and non-profit program development must pass through the same screens of variables: administrative (goals and policies), content (data base and skills), instruction (teacher and learner) and milieu (social and physical environment). Even though esoteric nomenclature within both systems mask the similarities in the screens these are the common denominators of the systems.

The matrix is constructed by the environmental educator having surveyed these common denominators. The data base with skills leading to an evaluative instrument are prepared as lesson plans called "Discovery Treks." The Discovery Treks are written to the specifics of the group coming into the site. These lesson plans are the units of the matrix.

Repeated experience has identified certain skills and data popular among teachers of certain grades and backgrounds. These topics or skills have been given program identification status when printed in an education program bulletin mailed out to the several school districts served by our center. Once a teacher has contacted the environmental educator, the topic, skill, grade level, number of students, and date of the program are determined and scheduled. A copy of the lesson plan is sent out along with a vocabulary poster depicting the cover of the Discovery Trek that will be used and the date of the trip. The scheduled event is posted at the center. Guides trained in the particular Discovery Trek sign up to lead the group. Students are divided into groups of ten, each led by a trained guide. New guides are trained in the Trek or older guides re-trained if the contexts of the scheduled trip are new. The Discovery Treks themselves are subject to seasonal changes for which the guides are responsible. The Discovery Trek is the common denominator for all expectations and commitments of the two systems involved.

The poster is used to stimulate a pre-session presentation by the teacher during which each student is made aware that, upon reaching the site, he will receive his own Trek and be held accountable for the data of the trip. Application of the skill demonstrated in the Trek can be evaluated in any way the school pleases and provides for a post-session experience if desired. Quite often crumpled Discovery Treks come back to the center accompanied by parents being led by an enfranchised student. This "after-the-fact" outreach aspect is one of the program evaluation tools used by the center. Once at the center, the teacher may or may not become aware of the lesson plan matrix depending upon the personal profile of the teacher. The same intangible factor has demonstrated itself in structured in-service programs.

The matrix is usually graphic, such as quilt, an Indian cape, a blanket, a model of an old mill or colonial house in the valley, cast aluminum plaques or a montage. The technique of interpretation is uses to direct the focus of the learner and provide a context for the data. The focus may be in the social or natural environment. Since center programs may address only issues that can be demonstrated within our valley, every Discovery Trek involves a trail experience and an actual site involvement. The Discovery Treks are deliberately rough and considered to be field notes not finished pieces of work. This form requires the student to become aware of the data, document what he perceives to be the data, make decisions about it as he organizes it in some manner. The museum-like tangibility of the matrix materials allow change and re-arrangement of the data. The technique is extended to each student as subsequent Discovery Trek experiences are arranged by each student in his own shoe-box museum. In this way content, process and skill levels can be evaluated for each learner. The four program objective levels of the center, as constrained by ecology are: awareness, skill acquisition (which includes identification, gathering and documentation), evaluation (organization) and presentation (action) (Schoenfeld, 1981). The Discovery Trek is the instrument that binds the variables of teacher, discipline, students and administration to the same variables within the non-profit's program development system.

Examples of matrices are: Spring Things, Ecology, Deer Lore, Indian Lore, Energy Flow in Nature, Cycles and Recycles, Flying Things, Growing Things, Acid Rain, Cry of The Eagle. A demonstration was conducted using an Ecology Discovery Trek.

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WRITING AN ENVIRONMENTAL AUTOBIOGRAPHY: AN EXERCISE IN UNDERSTANDING ENVIRONMENTAL VALUES

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Introduction

Environmental education at its best connects to the experience of individuals. Environmental attitudes and values are quite directly connected to individual´s experiences, and people can recall and reconstruct many of the memorable experiences which have influenced their environmental preferences, values and attitudes. In considering how to draw on the richness of people´s experience and its role in the development of environmental values, environmental autobiographies play an important role.

Environmental autobiographies are personal documents, usually written and sometimes graphic, that are meant to heighten peoples´ awareness of their own environmental history and to alert them to how the settings of the past affect their current environmental preferences and values. This group undertook to write environmental autobiographies and to reflect on them individually and as a group. (See appendix for instructions given to students to prepare them for this exercise.)

We trusted each other; that trust made it easy to write and discuss our environmental autobiographies. We had been together for a few weeks before we started writing and had been talking together about other peoples experiences as well as our own. It was important to understand that our experiences were valid enough to write about and that we were legitimate sources of our own knowledge. It was a way of telling our own stories.

As each autobiography was read and re-read, a number of categories were found that classify to some extent the experiences people write about--kinds of environments, particular activities/incidents and ages at which these took place, other people involved, senses, emotions/feelings, aspects of nature, and personal insights.

Categories

People. Everyone identified people with whom they shared "environmental" experiences--parents, friends, siblings, local experts--interestingly, not our classroom teachers. It seems that both positive and negative role models influence our environmental attitudes; we mimic actions we feel are right and reject behavior we feel is inappropriate.

> My mother does not participate much in nature but she has given me, through her art, ways of perceiving nature's different moods. I realized that my sensitivity of nature is shared by my mother when I saw the name she called a certain watercolor that she did. It was a misty picture of a hardwood stand in early spring with a small plant pushing up through the snow. She called the painting "Walk Softly" and I loved her for it.

Kinds of environments. We looked at places, spaces and locations to see where the memorable ones were and found that they were everywhere--the sidewalk, local parks, backyards, school yards, local ravines, creeks and rivers, fields and forests, as well as distant shores. Most important, we think, is that most of the spaces and places identified were at, near or within easy access of home (or a second country home), school, or relatives' homes. Most of the places we mentioned are local and familiar.

It seems that places are much more than physical locations; they seem to call up packages of activities, events, people and feelings which generate insights on "Life, the Universe and Everything". Meaningful places seem to be a blend of personal characteristics--our age, stage and interests, perception, and physical location.

> Not too far from the cottage was a dirt road called MacDonald's road...so narrow and bordered by a steep canyon some 15-20 feet high, carved by a clear, bubbling stream. This was an enchanted road. Due to the cliffs, sunlight shone only for a couple hours every day. For days, maybe weeks, I wanted to find out where this road went.... Equipped with field guides

> of all sorts, a pair of binoculars and a note book, I felt like a pioneer naturalist exploring a world unknown to people.

Events and activities. Events and activities bear out what is indicated by places. Certainly, being outdoors predominates, and people are involved with being outdoors in a tremendous number of ways. We found that we like solitary, personal and quiet things, that special events are very significant, and that we also like more social, active adventures.

Though no two life patterns are the same, significant events and activities are a familiar and a regular part of our everyday lives. While special and unexpected things stand out, the familiar is special too.

> When I was about seven, my dad took me to the garden nursery as this was something I enjoyed and he let me pick out the kinds and colors of flowers to plant in the gardens, as it was springtime. He also bought a good-sized red maple tree. We went home and I watched him place the plants in their plots around the house and he saved the maple for last. I remember it was late in the day and the sun was setting when the tree was finally planted to the right of center on the rise of our front lawn. My dad told me that this was for me and I remember feeling very happy and proud to receive such a strange gift of a living thing planted on our lawn; something that was mine but that I could never really have. Once in a while I drive through this old neighborhood, past our house and if I have company, I point out the now great maple tree that I still consider to be mine.

> In the dark, my bare feet found the familiar dirt ledge, and I sprang down to the rock below and then into the black water. The wet cold was an exhilarating shock on my skin, and the water rushed against my ears as I went down. ...I felt both a sense of wonder and a delicious attention heightening nag of fear at the thought of the black fathomless body I was being carried on...We could only go forward, letting the river take us. If I tuned in the voices and splashes of my friends, I was with them, and if I tuned out the voices and listened only to the ceaseless murmur of the river and the faint

> night sounds of the overhead forest, then, in the blackness, I was alone.

Aspects of nature. We identified lakes, mountains, beaches, snow, trees, flowers, animals, seasons, colors, sunshine, light and shade as important aspects of nature, and found that these are associated inherently with places, feelings and senses. What is clear is that nature is not synonymous with natural environments. People describe nature in countless ways in environments that include inner cities, suburban housing developments, back and front yards as well as in remote wilderness areas:

> Throughout high school, I renewed myself cycling to distant parks or fields. I would sit and observe; feel and think. Without these experiences, I lose something within. I still find myself seeking out the river near my house in Montreal...finding a relatively untouched spot, surrounded by tall grasses, I dangle my feet off the edge of the earth. Hidden from the rest of the world, for a while I drift, letting my mind and soul sweep along with the swift flowing current.

> The wind upon me is probably the most significant stimulus I experience now when I´m in the outdoors. Since it most often causes me to recall past outdoor experiences, it makes me feel like a part of the surroundings rather than just a stranger passing through. It is not surprising that the wind has this effect on me; the island I speak of was left exposed to the wind by zealous farmers and loggers of an earlier time, thus making its presence more common than not. It is very few days of the year when an islander can not determine his or her bearings, blindfolded, given the odds that there will likely be a westerly passing about their head.

Senses, emotions, feelings. Feelings seem to be the connections between activities, events and personal involvement. The kinds of feelings we described are to some extent predictable. There are overwhelmingly positive associations with most of the memorable places and events described: unabashed pleasure, joy, happiness, calm, peacefulness, security and safety alongside challenge and excitement, responsibility, anticipation, a sense of mystery and spirituality and powerful feelings of connectedness with nature.

While many of our experiences are positive, there is plenty of evidence that this is not always so. Nor do negative feelings detract from the memorableness of the experiences. Quite the opposite. Events that are fearful, painful, and frightening are sharply remembered:

> When involved especially in routine fishing exercises, I loathed the experiences on many occasions because of the harsh working conditions, where I found myself to be cold and wet and hoping for it to be over. In later years when I was more physically capable of contributing to the fishing exercises, I took much more pleasure out of the natural surroundings. The harsh spring-time winds, and the cool spray off the fishing gear became challenges to overcome, part of a never-ending initiation and conditioning exercise sponsored by parent nature.
>
> I must have been about seven years old....It was dusk or at least dark from the clouds and dust and I was alone. As I left the cabin and began walking, I heard the winds blowing as if they were blowing in a circle. I looked up and saw the high clouds churning in the sky as if God's finger was stirring them around and around and would soon be visible through the clouds pointing at me! I was terrified and ran the rest of the way to the safety of my parents.

Summary. How to develop environmental values? One of us identified the formula that worked for him, and that many of us found we could identify with:

--an introduction to nature at an early age;

--the influence of role models;

--reading books about nature;

--recreational activities like swimming, skiing, hiking, etc.;

--the chance to explore on your own;

--experiences with wild and domestic animals;

--close association with a particular species--
learning about its habitat and behavior;

What were the implications of this exercise? The first and possibly most important was the validation of our personal and collective experiences. Equally important was the recognition of the range of environments that each of us had experienced; this suggests that environmental educators need to examine the range of opportunities available to them and take fuller advantage of them. The third was that none of us mentioned school; this suggests that the formal education system had a limited impact in making us environmentally aware. We were forced to recognize two things: that school is not the only place where learning takes place, and that educators can do much more to help people become environmentally aware.

Conclusion. Learning together about things that matter deeply to us is exciting, meaningful and satisfying. We know more about our own intentions as educators, about who we plan for and about what really matters to them. There can be more congruity between what we know and what we are prepared to do for others; and perhaps most importantly, we have come to know that we can trust people to be involved with and to appreciate their many environments on their own terms. And we have learned that, as environmental educators, we can shape expanded roles for ourselves in helping people to better see their own experiences for what they are.

The insights derived from reflecting on our experiences are powerful reinforcements for the value of this kind of voyage:

> By writing this autobiography, I have become a whole person, connecting a past with the present. I have come to realize that there was a deep-rooted environmentalist within me that simply blossomed with the proper environmental conditions. I now feel more solid in my attempt to create a future more interrelated with the environment, for myself and for others.
>
> I am always in the middle of my environmental autobiography, and until I become grass again and can whisper my story only to the wind and the tiny things, I shall remain in the middle of it. So please excuse both the brevity and the length of this story, and remember one thing

from it--that nature is magic and that I believe in it.

NOTE: Miriam Wyman (course director) was the only person to read the autobiographies in their entirety. The rest of us shared, verbally and in written form, only those parts we felt comfortable disclosing to each other. In our conference presentation each of us read, in our own voices, excerpts from our environmental autobiographies that demonstrated points we were making. Space considerations prevent us from including the entire script, however transcripts of the presentation may be obtained from Miriam Wyman, 11 Model Ave., North York, Ontario M3H 1V9. We leave the quotations nameless but include all of our names in the position of author. This has been a collective enterprise from beginning to end.

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APPENDIX

Environmental Autobiography

All of us have had memorable experiences which have influenced our environmental preferences, values and attitudes. Environmental autobiographies are personal documents--written and graphic--meant to "heighten (peoples) awareness of their own environmental histories and to alert them to how the settings of the past affect their current environmental preferences and values." (Cooper Marcus, 1978). I like to encourage this kind of environmental values analysis for a number of reasons:

--to explore the development of personal environmental preferences, values and attitudes;

--to understand the importance (and validity) of personal environmental experiences and preferences;

--to raise unconscious preferences, ideals and ideas to conscious levels so they can be examined;

--to develop skills of visual and written thinking in recounting environmental experiences;

--to go beyond superficial environmental preferences and to delve into more deeply held environmental values;

--to counter elitist environmental aesthetics with a knowledge of personal often submerged environmental values and attitudes.

I'm asking you to take a documented voyage into your environmental past. To do this, you are to describe childhood experiences which you feel influenced your present concern with things environmental--to describe these experiences objectively and subjectively--and to analyze the extent to which they are reflected in your current personal and environmental preferences. In other words, what in your past helped you become the concerned "environmentalist" you are today.

Think back to all the significant environments you have experienced. Try to go back to your earliest childhood memories. Essentially you are taking yourself on a guided reflective trip into your past. Try to remember and describe the feelings associated with your experiences, and push yourself to delve as deeply as you can into your persistent environmental values.

Write as much about these experiences as possible, especially about what they meant to you and why them seem so memorable. Include as much detail as possible--when they happened, where you were, what you were doing/watching/feeling, who you were with--and anything else that seems relevant. And try to make connections between these experiences in your past and your present interest in environmental matters.

This is an exercise in both description and analysis. We will undertake it both individually and together, and will, I hope, come to some new and interesting understandings of our own experiences and those of others.

EFFECTIVENESS OF GYPSY MOTH EDUCATION MATERIALS FOR INCREASING HOME OWNERS' UNDERSTANDING:
SOME PRELIMINARY FINDINGS

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As environmental problems continue to become more prevalent and severe, "ordinary" people must be involved in environmentally responsible behavior. One way to enhance this involvement is through understandable environmental education. However, providing understandable information about environmental problems is difficult. For instance, environmental problems often seem not to relate to "ordinary" people. Furthermore, they are often technical, so experts use a great deal of jargon to communicate about these problems. Despite these difficulties, education about environmental problems is prevalent. Unfortunately, few guidelines are available to assure the understandability of this information (Butcha, 1985; Simmons, 1983).

Various elements, however, may be incorporated into information to make it understandable. One element that seems to make information understandable is structuring the information by "chunking" (Mathes & Stephenson, 1976). "Chunks" are segments of information, such as a word, or concept. Distinct chunks are useful because people can actively process only 5 +/- 2 chunks of information at one time (Kaplan & Kaplan, 1982; Walker, 1987). Chunks may be delineated with formatting cues, such as headings, and with graphics.

A second element that makes information understandable is "legibility" (Kaplan & Kaplan, 1982). One aspect of making information legible is making it concrete. This is important since people are better able to recall concrete information (Nisbett & Ross, 1980; Bransford, 1979). One way to make information concrete, especially information about desired environmentally appropriate behaviors, is to provide explicit, detailed descriptions of the behaviors. Providing this explicit behavioral information has been useful in encouraging the desired responses for natural hazards (Sims and Baumann, 1983), and forest pathology (Nicholls and Prey, 1982). Legible information also lacks jargon.

These elements are rarely incorporated into information about environmental issues. For example, explicit, detailed information about appropriate behavior is frequently excluded in natural resource agency publications (Frzio, 1979). Hence, this paper discusses the results of a study which focused on incorporating the above elements into educational brochures on the gypsy moth in Michigan in order to make them understandable.

Methods

The main independent variable, "communication effectiveness," was incorporated into several educational brochures about the gypsy moth. "Communication effectiveness" was operationalized as a combination of elements hypothesized to make the brochures understandable. These elements were: 5 +/- 2 Chunks, Legibility, and Explicit, detailed individually-oriented and community-oriented management (behavioral) information. Each brochure was rated high, medium or low in "communication effectiveness". Further details on brochure development and the rating procedure are found in Young and Witter (in press). All brochures contained information on biology, impact and management of the gypsy moth.

These brochures were delivered to a stratified random sample of homeowners in two urban centers in Michigan. In addition, some people served as a control, and did not receive a brochure. One week later, these home owners received a questionnaire. The questionnaire contained 16 multiple choice questions to assess home owners' understanding of gypsy moth biology, and ways to appropriately manage it.

Results and Discussions

Overall, the data suggests that the above discussed elements of "communication effectiveness" are important for increasing respondents' understanding of the gypsy moth.

"Chunks" are somewhat helpful for respondents' understanding of the biology of the gypsy moth, and ways they can manage it. Half the items which solicited respondents' understanding of the biology of the gypsy moth, and two-thirds of the items which solicited respondents' understanding of ways they could manage the gypsy moth are significantly different among high, medium and low amounts of chunking (Table 1). Moreover, respondents with a high amount of chunking had a better understanding of both the biology of the gypsy moth and ways to manage it than did respondents with medium amounts, and low amounts of "chunking".

Table 1. Mean Responses for High, Medium, Low Chunks

	Rating		
	High	Medium	Low
Biological Content			
# of gm cause damage	2.5	2.4	2.3@
animals that eat gm	2.0	1.8	1.7*
gm travels by	2.3	2.3	2.3
gm looks like	2.3	2.0	2.3*
gm habits	1.9	2.0	2.2*
gm active in	2.1	2.0	2.0
Management Content			
to do when gm absent	2.2	2.0	1.9@
control lo #s (q7)	2.1	1.9	2.0*
control lo #s (q13)	2.5	2.0	2.0*
control hi #s	1.9	1.8	1.8
burlap bands used to	2.2	2.0	1.9*
best way use insecticides	2.9	2.8	2.6*

*=significant at p=.05; @=significant at p=.10; 3 point scale - right(3), part right(2), don't know/wrong(1).

"Legible," or easily understandable information, helps respondents better understand the gypsy moth. Five or six items which solicited respondents' understanding of the biology of the gypsy moth are significantly different among high, medium and low legible brochures (Table 2). Furthermore, two-thirds of items which solicited respondents' understanding of ways to manage the gypsy moth are significantly different among high, medium and low legible brochures (Table 2). However, the pattern of results is not what might be expected. Respondents with high legibility had a better understanding than those respondents with low legibility. But, respondents with brochures with high legibility and low legibility better understood gypsy moth biology and management than respondents with brochures with medium legibility. This suggests that highly legible, or easy-to-understand information, is more effective in increasing home owners understanding than information with a low level of legibility. It also suggests that a high level of legibility, or low level of legibility, rather than a mix of the two is easier for respondents to understand.

Table 2. Mean Responses for High, Medium, Low Legibility

	High	Medium	Low
Biology Content			
# of gm cause damage	2.4	2.4	2.3
animals that eat gm	1.9	1.8	1.6*
gm travels by	2.4	2.2	2.4*
gm looks like	2.3a	2.0	2.2*
gm habits	1.9	2.1	2.2*
gm active in	2.2	1.9	2.1*
Management Content			
to do when gm absent	2.1	2.0	1.9*
control lo #s (q7)	2.1	1.9	1.9@
control lo #s (q13)	2.4	1.9	2.0*
burlap bands used to	2.1	1.9	2.0*
control hi #s	1.8	1.8	1.9
best way use insecticides	2.9	2.7	2.6

*=significant at p=.05; @=significant at p=.10; 3 point scale - right(3), part right(2), don't know/wrong(1).

Providing explicit information on gypsy moth management, at both an individual and community level helps respondents better understand gypsy moth biology. For example, in two-thirds of the items respondents with brochures with a high amount of individual management information understood significantly more gypsy moth biology than respondents with brochures with a medium amount of individual management information (Table 3). Similarly, in five of six items, respondents with brochures with a medium amount of community management information understood significantly more biology than respondents with brochures with a low amount of community management information (Table 3). These findings highlight the close relationship of biological information to management information. Providing only biological information about gypsy moth may be insufficient for people to really understand the biological aspects of the gypsy moth. Management or explicit information about what people can do also seems important for increasing people's understanding of the biological aspects of the environmental problem.

Table 3. Mean Responses on Biology for Individual Management (Behavioral) Information and Community Management Information

	Individual Management Information	
	High	Medium
# of gm cause damage	2.5	2.3*
animals that eat gm	1.9	1.8*
gm travels by	2.2	2.3
gm looks like	2.2a	2.0*
gm habits	2.0	2.1*
gm active in	2.1	2.0

	Community Management Information	
	Medium	Low
# of gm cause damage	2.5	2.4
animals that eat gm	1.9	1.8*
gm travels by	2.4	2.2*
gm looks like	2.3	2.0*
gm habits	1.9	2.1*
gm active in	2.2	2.0*

*=significant at p=.05; @=significant at p=.10; 3 point scale - right(3), part right(2), don't know/wrong(1).

Providing explicit management information is somewhat helpful for increasing home owners' understanding of ways to manage the gypsy moth. For one-third of the questions, respondents with brochures with a high level of individual management information understood significantly more about ways to manage the gypsy moth than if they received a brochure with a medium level of individual management information (Table 4). Furthermore, in five of six questions, respondents understood significantly more about ways to manage gypsy moth if they received a brochure with a medium level of community management information than if they received a brochure with a low level of community management information (Table 4). These results suggest that providing explicit information about what people can do to manage the gypsy moth is important for them to understand what they can do.

Table 4. Mean Responses on Management for Individual Management (Behavioral) Information and Community-Oriented Management Information

	Individual Management Information		
	High	Medium	
to do when gm absent	2.1	2.0	
control lo #s (q7)	1.9	2.0	
control lo #s (q13)	2.2	1.9*	
burlap bands used to	2.1	1.9*	
control hi #s	1.9	1.8	
best way use insecticides	1.9	1.8	
		Community Management Information	
		Medium	Low
to do when gm absent	2.1	1.9*	
control lo #s (q7)		2.1	1.9*
control lo #s (q13)		2.4	1.9*
burlap bands used to		2.1	1.9*
control hi #s		1.8	1.8
best way use insecticides		2.9	2.7*

*=significant at p=.05; @=significant at p=.10; 3 point scale - right(3), part right(2), don't know/wrong(1).

Overall, these results suggest that incorporating the above discussed elements into information, does in fact help increase respondents' understanding of the gypsy moth. Chunks seem to help increase respondents' understanding of ways to manage the gypsy moth. Legibility helps increase respondents' understanding of both biology and ways to manage the gypsy moth. However, providing a medium level of legibility is less helpful than providing a high level of legibility, or a low level of legibility. Explicit, individually-oriented management information and community-oriented management information help people understand biology of the gypsy moth. Both types of management information are also helpful for increasing respondents' understanding of ways to manage the gypsy moth. Yet this management information does not seem as powerful in helping respondents understand ways to manage the gypsy moth as it does in helping them understand its biology. Hence, "Chunks", "Legibility", and "Explicit Management Information" should be incorporated into educational information to help increase people's understanding of a particular environmental topic.

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